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and
AIRCRAFT ENGINEER

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The Outlook

Leadership

SHORTAGE of paper prevented the daily Press from giving to Lord Tedder's address to the Headmasters' Conference the prominence it deserved. That was more than a pity. His inspiring words deserve to be read and pondered by every thinking man and woman who has the future of the Royal Air Force at heart. We are doing our best to place before as wide a public as possible Lord Tedder's address by publishing it *in extenso* this week, and we urge every reader to study it carefully and to absorb its implications.

Particularly impressive is Lord Tedder's evaluation of the sort of leadership demanded in the R.A.F.—different from and much more subtle than its equivalent in other Services; a leadership which, as the chief of the Air Staff says, "is based on personal and individual integrity and example, a leadership which inspires loyalty by imagination and understanding." An equally great basic truth is contained in Lord Tedder's matter-of-fact statement of what some would regard as sentimentalism: that the R.A.F. needs young men who have the call to serve their country in the air. In these materialistic times it is heartening to hear the head of the R.A.F. attaching the highest possible value to the fostering of a spirit of *service*. That, and not bedside reading lamps, is the right approach. It will demand leadership of the kind which Lord Tedder so truly describes, but given that kind of leadership the R.A.F. will arise again and live up to its motto: *Per Ardua ad Astra*. Already, as Lord Tedder said, it is beginning to emerge from the slough.

There are many other points in Lord Tedder's address to which attention might be drawn. For example, his refutation of the view, mistakenly held by many, that the R.A.F. needs fighters only for air defence. Even in the recent German war, the bombers played a decisive role during the later stages. The fighters in the Battle of Britain gave us the breathing space in which to build our bombers, but the fighters by themselves could not have won the war. If there should be another war, there is not likely to be such a breathing space, and it is well to heed Lord Tedder's warning that the only way to stop air attack may be to stop it at its source. That is precisely why this country's backwardness in modern bomber production is so disquieting. Unless we have the bombers ready on the outbreak of war, they may come too late to halt rocket attacks by bombing the launching sites and stores. Lord Tedder refrained from elaborating that point; perhaps he thought it unnecessary to do so, it should be self-evident.

Economics of Flying

TWO outstanding needs of civil aviation if it is to be self-supporting emerged from Mr. Masefield's British Commonwealth and Empire Lecture to the Royal Aeronautical Society: Reduction of overheads and better air traffic control. We say emerged advisedly, because the Director-General of Long-term Planning and Projects at the Ministry of Civil Aviation had written a small book on his subject: "Some Economic Factors in Civil Aviation." It takes some hours to read the printed paper, and it will take weeks or months to digest all the voluminous data and charts given therein. The sixteen points under which Mr. Masefield summarized his conclusions were published last week. In the spoken lecture he gave yet a different summary. It is lucky for Mr. Masefield, and for the aviation world, that he had large staffs to call upon at the Ministries of Production and Civil Aviation. It must have been a herculean task to collect all those statistics and the technical information relating to the various aspects of flying with which the paper dealt. We refer elsewhere in this issue to some of the points raised.

The sections of the paper in which Mr. Masefield looked into the future afforded fascinating glimpses of what can be expected—some day. We are more concerned with the present and the immediate future, which

are not quite so rosy. Every operating company in the world is making a heavy financial loss, if hidden subsidies and other unobtrusive aids are taken into account. Before we dream of fantastic speeds at third-class fares, it would not be a bad idea to learn how to fly economically and safely at 250 m.p.h. or so.

Mr. Masefield administers a cold douche by calling attention to the fact that overheads at present run from 40 to 70 per cent of the total costs of the main airlines of the world. That should give food for thought, as should his estimate that British air transport is costing some £71 million a year, whereas receipts fail to cover that amount by £28 million a year, which represents 2½d on the income tax. Quite a fair proportion of that loss could be saved by cutting down to one-half or one-quarter the number of people employed in the Ministry of Civil Aviation. (Our comment, not Mr. Masefield's.)

The Bottleneck

THE second direction in which improvement is badly needed, and one where worthwhile financial returns can be expected, is the control of air traffic. Progress in aircraft design has not been accompanied by corresponding developments in the growing traffic. This applies particularly to the main airports, where much time is wasted by arriving aircraft having to wait, sometimes for an hour or more, before being given permission to land. Not only do such waits entail loss of time and money, but the system of "stacking" is by no means devoid of danger, as was shown by the recent collision in which many lives were lost. Time is also lost through diversions.

It is bad enough to have piston-engined aircraft kept orbiting while awaiting permission to land. When turbine-engined machines with their high fuel consumption come into use, such long waits simply cannot be tolerated, and a better solution will have to be found if air transport is to develop as it could and should. Mr. Masefield advocated fully automatic landings. That will doubtless become possible in the future, but apart from the technical problems involved, there will be a good deal of prejudice to be overcome before pilots will hand over their controls to a robot, no matter how clever.

When we attain Mr. Masefield's ideal of landing thirty aircraft every hour during the day and night, we shall have gone a long way towards making air transport a really satisfactory undertaking. There still remains the question of transport from airport to city centre. At present the time wasted in orbiting at airports plus that taken to reach the destination in the city, not infrequently nullifies the whole advantage of travelling by air. How terminal facilities can in future enable full use to be made of really fast aircraft was shown by last Thursday's combined helicopter and Meteor demonstration, when London and Paris centres were linked by air in just over three-quarters of an hour. But it also showed the need for Mr. Masefield's "automaticity" in that the demonstration was four hours late, due to poor visibility in France.

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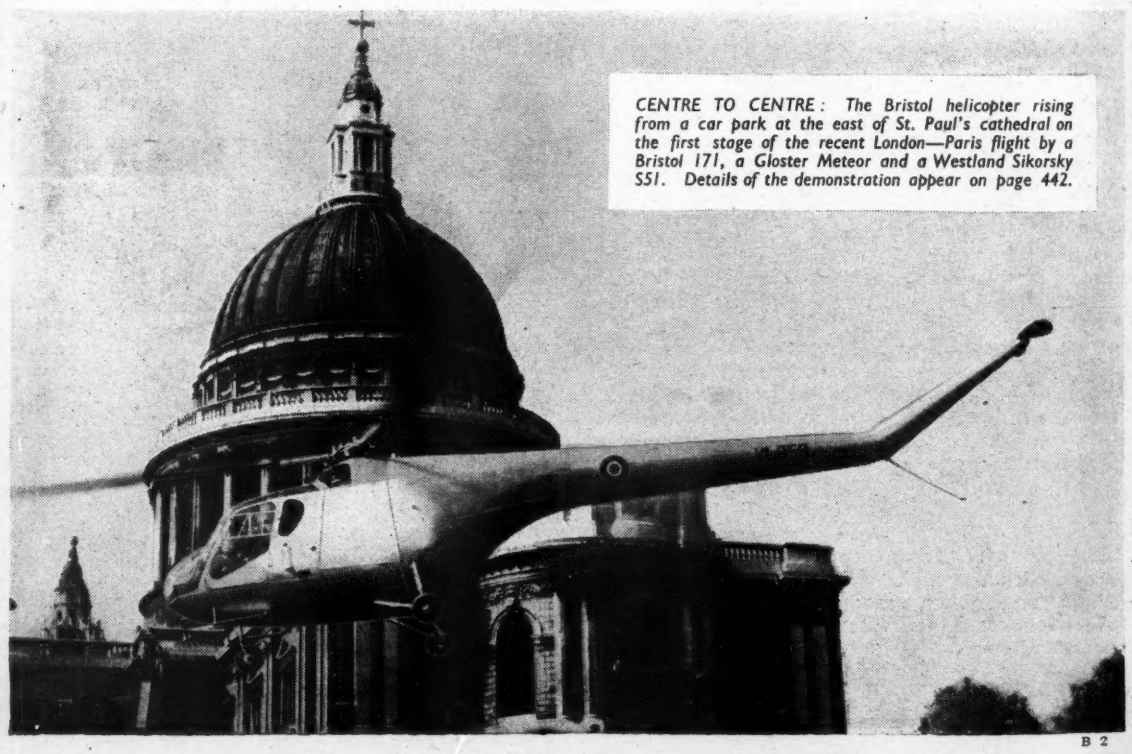


CENTRE TO CENTRE: The Bristol helicopter rising from a car park at the east of St. Paul's cathedral on the first stage of the recent London—Paris flight by a Bristol 171, a Gloster Meteor and a Westland Sikorsky S51. Details of the demonstration appear on page 442.

"Flight" photograph.

The fitting of an annular radiator and ducted spinner to this experimental Tempest 6 has slightly improved its performance and completely altered its appearance.

ANNULAR TEMPEST IN THE AIR

Flying Behind a Napier Sabre with Annular Radiator and Ducted Spinner

By Wing Cdr. Maurice A. Smith, D.F.C.

AN opportunity to fly Napier's experimental Hawker Tempest 6 fitted with a Sabre 6 engine with annular radiator and ducted spinner, was particularly welcome for several reasons. It is seldom that permission is granted for a civil pilot to fly military aircraft of this type, and the experience of flying again a high-speed fighter such as the Tempest is exciting in itself; moreover, I had never previously flown behind a 24-cylinder Sabre (except in a Sabre-engined Warwick) and had hoped to do so before these excellent military power units, still in service overseas, are superseded by gas turbines. Finally, the ducted spinner fitted to take in air for the annular coolant radiator, and recently used for the development of ducted spinners for small turboprops—in particular the Naiad—has, in some respects, improved the performance and handling of the "Spanular" Tempest, and I was interested to try to assess for myself the alteration—so far as is possible in one comparatively short flight.

Tempest NV768 is an early Sabre type brought up to full Mark 6 mod. standard, except that the ailerons are without tab assistance, whereas the standard Mk. 6 has spring tabs, and the Sabre 6 engine has separate throttle and airscrew levers, instead of a single power control. In the first place this Tempest was fitted with an annular radiator, later, a ducted spinner was added. Performance has been checked against that of the Sabre 5A-powered aircraft with somewhat bulkier-looking chin radiator as used in the Service. Incidentally, the performance of the Sabre 6 is exactly the same as the 5A, the difference between the two units being the provision of a gear to drive the fan to assist cooling. The fan is retained on the two Sabre 6s in the Warwick test bed, but having been found unnecessary on the faster Tempest was removed. The Tempest can be numbered among the fastest fighters with piston engines, being capable of about 465 m.p.h. at 20,000ft.

By comparison with the standard aircraft, the "Spanular" Sabre installation is a little longer and some three inches lower. Forward view from the cockpit on the ground is not particularly good, but in the air the view over the nose is better than one would expect. To give adequate ground clearance the airscrew blades have been cropped slightly. Some

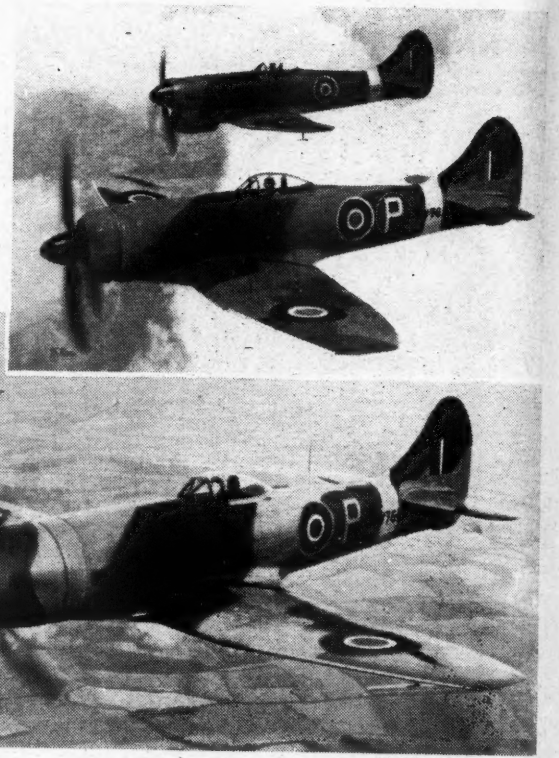
Details of the ducted spinner, cropped airscrew blades, air intake and exhaust systems on the Napier Sabre 6 installation are visible in this photograph.

Annular Tempest 6 In the Air . . . . .

ballast has been placed near the tail and for that reason the aircraft is limited to accelerations of 4½g. But for this, more might have been seen of the aircraft in displays, and perhaps it might have competed at Lympne.

It seems fairly certain that the absence of the chin radiator has resulted in a smoothing-out of airflow around the tail surfaces, and this is felt particularly at low speeds.

The cockpit of the Tempest is roomy and comfortable, but does not quite come up to the standard of the later jet fighters in regard to grouping, arrangement of instruments and simplicity. There are a number of controls to find and understand, and the hydraulic services are not self-neutralizing after operation. Boost, pitch, mixture and radiator need to be watched, and flap and undercarriage selection and locking is not quite as simple as on later aircraft. Again, many pilots are now becoming spoiled by the all-round good view from the tricycle tail-up jets, and as a result the size, height and length of a Tempest as seen from the cockpit are slightly alarming.



"*Flight*" *photographs.*

These three portraits provide a most interesting comparison between the standard Tempest 6 with chin radiator, the experimental Tempest 6 with annular radiator, and the same aircraft in its latest form with ducted spinner and annular radiator.

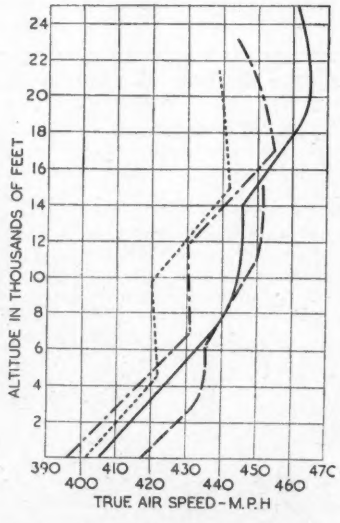
Pre-flight Briefing

A few minutes' briefing from Jack Olver, Napier test pilot who has done many hours of development flying on this aircraft, sufficed to clear up doubts and remind me of the sequence of operations, and on the second cartridge the Sabre was away.

At first I taxied painfully slowly and carefully (sitting as heavily as possible on the back end of my parachute) feeling convinced that with so much forward of the cockpit a hollow in the grass or too hard a nip on the powerful brakes would put me on my nose. However, I soon found that these fears were ungrounded, and proceeded to get on with the job more confidently. Take-off on this Napier-Tempest from the fairly rough grass field at Luton calls for no special comment. I had been told that +9 lb boost at 3,750 r.p.m. was adequate, but +15 lb at 3,850 was available if I preferred it. Swing tendency was quite pronounced after opening up, but easy to control. In an endeavour to watch dials and airfield both at the same time, I made what might be called a two-tone take-off. The urge and noise shortly after moving off was very considerable with throttle and r.p.m. at the high stop, so after a hundred yards or so I eased back to a less urgent-sounding power output at around +9 lb boost and climbed comfortably away at 2,500 ft/min and 200 m.p.h.

I had expected that the Sabre with its 24 cylinders and sleeve valves would be particularly smooth in operation, and, in fact, it is so, though not quite as smooth as I had expected. When this point was mentioned after landing, I was informed that any roughness can be attributed to distribution. It is no mean problem to arrange even distribution to the 48 widely dispersed inlet ports in the sleeves. Strangely enough, the Sabre VII which has the highest boost pressure of any of the Sabre series, has proved to be exceptionally smooth. This may be due to the water/methanol injection.

Speed builds up rapidly in level flight and quickly reaches around 350 m.p.h., and it is apparent that the airframe is very clean. Roll performance is good, particularly in view of the absence of tab assistance on the ailerons. One complete roll at about 300 m.p.h., which I timed roughly, took rather less than 4 seconds.



Performance figures for four types of Sabre-engined Tempest.
---------- Tempest 6 with Sabre 5 (maximum boost +15 lb boost at 3,850 r.p.m.) and 8-blade 9-deg.-root-angle diffuser.
— — — — Same aircraft fitted with 12 blade 13-deg.-root-angle diffuser.
— — — — Standard Tempest 6 with Sabre 7 (maximum boost +17½ lb boost at 3,850 r.p.m.)
———— Tempest 6 with Sabre 5A, ducted spinner and annular radiator, and 12-blade 13-deg.-root-angle diffuser, as described in this article.

Stalling qualities have, it seems, been made a little more gentle, and at a weight of around 12,000 lb with everything up, the engine-off stall occurs at approximately 105 m.p.h. Some warning signs a few m.p.h. faster are followed by snatching at the left aileron. Recovery was rapid. The standard machine is stated to stall at 108 m.p.h. I.A.S. at 12,300 lb weight and at 92 m.p.h. with flaps and wheels down.

On the approach I was interested to feel the changes of trim as services were operated. Flaps down produced a fairly pronounced nose-down tendency, wheels down more nose-down, but radiator gill opening had no effect at all. The opening action for the annular radiator, it will be remembered, is a rearward movement of the annular "gill."

It is probably on landing that the difference between standard and annular Tempest 6 is most easily detected—for control on holding-off remains positive and sensitive until the actual touchdown, and the aircraft can be felt down on to three points in true Tiger Moth style. A slight swing may try to develop on the landing run, but, as on all occasions on the ground, the Tempest with its wide undercarriage

and powerful brakes is in no way difficult to control.

Descriptions of the ducted and annular radiator, and detail comparative results of performance were printed in *Flight* dated October 3rd, 1946. Since that time the ducted spinner has assumed great importance for application to small turboprops. Fitted together with the annular radiator to the Sabre, an overall drag improvement of 8 per cent was achieved by comparison with the standard installation. Few, except those intimately connected with the work, realize the importance of a reduction of as little as 1 per cent of drag in cooling or air intake installations on the net thrust produced. Moreover, when comparisons are made of piston engine b.h.p. and shaft horse power in gas turbines, and these related to aircraft performance, mention of their respective drag figures is frequently overlooked.

The latest Naiad spinner is similar in all important respects to that on Napier's Tempest, but some detail improvements have been made, and the chord of the outer shell of the rotating spinner has been reduced. It is probable that this work on ducted spinners carried out by Napier's experimental establishment at Luton, will be of value to many other companies producing small turboprops.

Casual Commentary

Thoughts After the S.B.A.C. Show : Why Not Invite a Guest to Speak? : A Hard Time for the Pilots : Chances Must be Taken

By ROBERT CARLING

NO doubt there are a hundred and one ways of achieving success in what is so horribly described as "publicity"—each method depending on the character of the person one is expected somehow to impress.

At one extreme we have the simple exaggerative "ours is by far the best and there's nothing whatever wrong with it" kind of approach, in which it is faintly hoped that 25 per cent of the electorate will believe 25 per cent of the story. At the other extreme we have the over-subtle "ours is really not too bad at all" approach in which 50 per cent of the electorate is expected to infer that the product is 50 per cent better than it is actually said to be. The best line most probably lies somewhere between the two extremes.

Which is by way of being a gentle introduction for the suggestion that we always seem to overdo the personal trumpet-blowing at the S.B.A.C. Show.

Our foreign visitors—who are not likely to be entirely ignorant of the total picture—and we ourselves would, I think, be much more impressed if the congratulations were interspersed with a few lightly worded criticisms and realistic but constructive comments. Again, it has always seemed to me that there is something wrong about a speech-making programme in which no visitors' names appear on the toast list.

Would it not be a pleasant and very English arrangement if the main speech—extolling, if you like, our products—were to be made as a welcome to the foreign visitors, while the reply came from one of our many old-established, knowledgeable and witty friends from abroad? The proposer would then, in self-defence, be forced to laugh at some of the errors of our ways, and the responder would be able to pull our legs just as far as this was consistent with good manners. We should thus be prevented from taking ourselves too seriously, while, at the same time, making a really worthwhile gesture for the benefit of the only people who, in the end, really matter—the overseas visitors.

This year's Exhibition was certainly remarkable for the way in which trump cards, in the way of new aircraft, were turned up at the last minute. I never remember an occasion on which at least two large aircraft had been known to have made their first flight within a couple of days of the opening of the show, yet managed to put in the time necessary to be allowed to take part in the flying display.

But the whole thing was pretty hard on the pilots—not only on those conducting the newcomers, which had to be demonstrated after such an absurdly short handling-check period, but also on those of all the tougher aircraft. There were five flying days and on two of these days the weather was indifferent to very poor. That there were no accidents—and only one or two moments when the more knowledgeable spectators suffered a contraction of the heart muscles—can be put down to luck and to the very high standard of skill among the fifty or so test pilots.

Incidentally, these boys certainly carry the responsibility in a way which is not generally appreciated. It's a case of "heads I win, tails you lose" on so many occasions when risks must be assessed and taken by a pilot with the clear knowledge that he will receive nothing but blame if it doesn't come off, or, alternatively, a wigging from his directors if he doesn't put up a good show. He's in trouble either way, but everybody slaps everybody else's back if all is well.

Justification by Results

Of course, there's nothing new about these one-sided risks which have to be taken in order to get anything done The history books are full of the names of people which are printed in bold type because they got away with murderously thin chances, or because they happened to be on the winning side and were therefore dubbed patriots rather than traitors. I am not supposing that Master Drake would have received anything better than a brief disparaging mention as a pirate if his round-the-world *Golden Hind* had not been lucky enough to slip into deeper water after being aground in the Molucca Sea, or wherever it was.

Nevertheless, it will be a bad time in this safety-first pass-the-buck, black-coated civilization when there is not a soul left who dares to take a big risk on his own responsibility and in spite of all the rules and regulations which are slowly hemming us in. Not that this is likely. Already the vaguely proficient amateur pilot is learning to be a free-booter—developing bad eyesight when handed a sheaf of *Notices to Airmen* and suffering from premature lapses of memory at the very thought of the things he will be expected to know and to do when the whole complicated business is thoroughly organized to the satisfaction of the various people concerned with our personal safety.

Rules of safety there must be, and these must be kept in the spirit if not in the letter. It will be up to the administrators to see that, in a praiseworthy effort to guard the lives of the innocent airline passenger and the still more innocent householder below, the whole business of flying isn't reduced to expensively strait-jacketed uselessness. That one-in-a-million affair of the York and the Skymaster, it will be astringent to remember, might never have happened had there been no flying control. Other collisions, maybe, but not that particular one. It is not likely that, in a sky of moving objects and pure chance, two aircraft would have been in such close proximity. During the war, in an almost uncontrolled air, with thousands of aircraft flying daily in all kinds of weather, collisions were so rare as to be almost unheard-of on non-operational flying.

Let there be rules, but sensible ones and not too many or too strict. There is too much of a tendency nowadays to treat all citizens as if they are without any shred of intelligence or personal initiative.

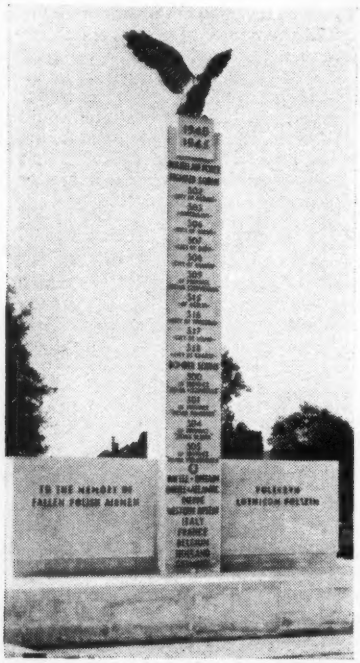
HERE AND THERE

Stratocruisers Test Dive

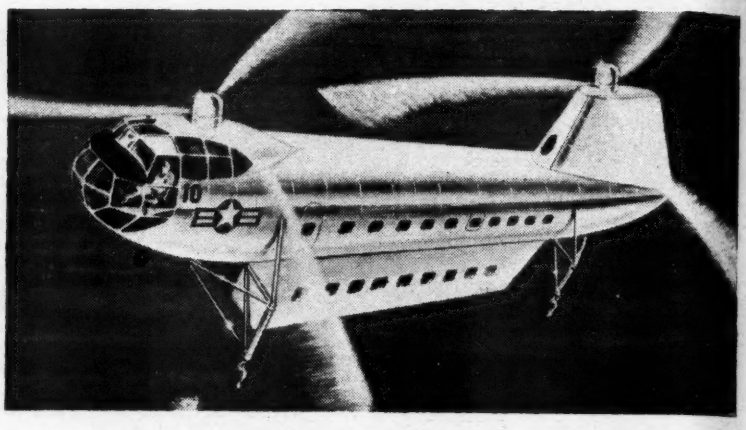
ACCORDING to the assistant chief engineer of the Boeing Company, a Stratocruiser recently achieved a speed of 498 m.p.h. in a test dive to ascertain the aircraft's structural and flight characteristics at speeds greatly in excess of the Stratocruiser's normal cruising speed of about 340 m.p.h. The designed normal take-off weight of the aircraft is 135,000 lb.

Heaviest Single-engine Take-off?

THOSE who witnessed the striking single-engine take-off and demonstration flight of the Airspeed Ambassador at Farnborough during the public day of the S.B.A.C. Show, will be interested in the weight figure at which this performance has been executed. The highest weight at which this aircraft has taken the air with only one engine running is 37,000 lb and this was from a 1,350-yard runway. This must surely be the highest weight at which a "single-engined" aircraft has ever flown. The next heaviest in this country is probably the Eagle-powered Westland Wyvern at 22,000 lb.



POLISH MEMORIAL: Just outside the perimeter at Northolt airport, this tower has been built as a memorial to the 546 Polish pilots who were killed while serving with the R.A.F. Northolt was the main base of the Polish Air Force during the war. Readers of the "Daily Telegraph" contributed over £2,000 towards the erection of the tower, on the base of which are inscribed the names of the airmen.



AMERICAN HELICOPTER PROJECT: An artist's conception of a new helicopter now being developed by the U.S.A.F. Known as the Piasecki XH-16, this is claimed to be the largest transport helicopter ever to be built. It is of all-metal construction and has tandem rotors. A detachable portion is incorporated to expedite unloading.

M.P. AT AVRO'S: After touring the Avro factories in Manchester recently, Mr. J. Freeman, M.P., Joint Parliamentary Secretary, M.o.S., was taken for a flight by Mr. J. H. Orrell in the Avro Athena 2 Trainer. He is here seen in the cockpit at Woodford.

Mr. Frise Honoured

LESLIE G. FRISE, B.Sc., F.R.Ae.S., has been admitted to the Freedom of the City of London. Although known chiefly for his aircraft designs such as the Blenheim, Beaufighter, Brabazon and Freighter, when chief engineer of the Bristol Aeroplane Co. he also pioneered extensive developments on aircraft and gun turret hydraulic systems. His election, therefore, to the Freedom and Livery of the Worshipful Company of Plumbers finds him in congenial company.

Noise Complaint at Norwich

WHEN making a routine inspection of Horsham St. Faith airfield on October 1st, Mr. Arthur Henderson, Secretary of State for Air, examined complaints about the noise of jet aircraft flying in the vicinity of Norwich. Brig. Medlicott, Liberal National M.P. for East Norfolk, had invited Mr. Henderson to investigate for himself the allegations that school lessons were being interfered with and that in Hellesdon, a suburb of Norwich, ceilings had been brought down by the noise of aircraft.

Sir C. Tennyson Retires

AFTER 20 years with the Dunlop Rubber Co., Ltd., Sir Charles Tennyson, C.M.G., secretary of the company, retired on October 1st. Before joining Dunlops in 1928 Sir Charles was for eight years deputy director of the Federation of British Industries. He edited the shorter unpublished poems of his grandfather, Lord Tennyson, the poet laureate, and has himself published *Cambridge from Within*. He will continue to assist the Dunlop Co. in an advisory capacity.

Thunderjets Grounded

PENDING investigations into recent accidents to Republic F-84 jet fighters, all aircraft of this type have been temporarily grounded. Four crashes have taken place recently of F-84 fighters, of which the U.S.A.F. already possesses a substantial number and expects to have at least 360 by the end of the year. Known as the Thunderjet, early versions of the F-84 were powered by General Electric T.G. 180 axial flow gas turbines. The later models, F-84 C, are being equipped with Alison J-35-A-15 power units, and experimental machines are being developed using T.G. 190 jets.

Promoting Radio Exports

MAJOR J. VIVIAN HOLMAN, A.F.R.Ae.S., M.I.Ae.S., for many years well known in aeronautical and yachting circles, has joined the board of Philco (Overseas), Ltd., as acting managing director. The new company is a British-owned subsidiary of the Philco Corporation, and has been formed to distribute British made Philco products overseas. Major Holman, recently managing director of Philco Radio and Television Corporation of Great Britain, Ltd., has been loaned by Radio and Television Trust, Ltd., of which he is a director. He is resigning other directorships in order to concentrate on his new appointment.

U.S.A.F. Honour for Mr. Churchill

THREE generals of the U.S. Air Force, at a recent ceremony at Madison Square Garden, presented their pilots

HERE AND THERE

wings to three outstanding citizens chosen by the U.S. Air Force Association. General Spaatz, formerly Chief of Staff of the U.S.A.F., pinned the wings he wore as General Commanding the Air Force in the European Theatre on W/Cdr. J. Johnson, a British fighter pilot, for presentation to Mr. Churchill later. A telegram from Mr. Churchill was read by Mr. Baruch, who also received a similar award, which said: "I am sure that the British and American pilots will work together with their world-famed efficiency and devotion to preserve the cause of freedom and justice among men and to strike at tyranny, whatever livery it wears."

New Rolls-Royce Turbojet

THE existence of still another Rolls-Royce gas turbine, the Tay, was recently revealed. The particular model, a turbojet, details of which remain secret, is known as the RTa.1. Thus, in the River Class the company have produced turbojets known as the Welland, Derwent, Nene, Avon and Tay, the first-named now being obsolete; and propjets called the Trent, Clyde and Dart of which the former was a development unit only.

Turbo-Wasps

ALL airscrew turbines and turbojet engines produced by Pratt and Whitney will in future be known as "Turbo-Wasps"; this choice has been made since the name Wasp was used to identify the original Pratt and Whitney aircraft engine developed in 1925. The company's first pure jet engine (the Rolls-Royce Nene), production of which is now under way, will be known as the Turbo-Wasp J.6B; its announced rating is 5,000 pounds thrust and it is used in the Grumman F9F-2 Panther. Navy carrier-based fighter.

Leslie Irvin Arrives

AFTER flying the Atlantic from New York to London Airport on September 27th, Mr. Leslie Irvin was met by Capt. A. H. Youell with an Irvin Bell helicopter at Heathrow. Mr. Irvin was flown to Hanworth for lunch and later Mr. Youell took him to his home at Letchworth, Herts, where he landed on the front lawn which measures about 12 by 5 yards. Mr. Irvin is to remain only a short while in Britain and expects to visit Sweden and possibly Spain before returning to America.

Australian Air Fire Protection

WITH the object of saving dollars, the Australian civil aviation authorities invited Australian firms to design and produce a special fire detection and control system for use in civil aircraft; accordingly the National Motor Springs Pty., Ltd., of Sydney have now developed a press button operated system. A warning light indicates the existence of a fire in any nacelle whereupon the pilot by pressing a button stops the engine, feathers the airscrew and discharges the extinguisher bottle; simultaneously oil and fuel supplies to the defective engine are cut off. Successful extinguishing of the fire automatically resets the valves and switches off the pilot's indicator; the engine may then be restarted and pressure of a further button restores oil and fuel feeds.

M.A.E.E.: A Saunders-Roe S.R./A1 jet fighter, a Short Seaford and a Supermarine Sea Otter will be recognized in this recent scene at the Marine Aircraft Experimental Establishment, Felixstowe. The occasion was the recent "Open Day."

News in Brief

It has been decided by A. V. Roe, Ltd., to abandon the title Tudor for the Mark II aircraft which is now being used for freighter purposes.

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The Minister of Civil Aviation, Lord Pakenham, left Northolt on October 4th for a two-day tour of Wales to inspect numerous airfields and visit the B.O.A.C. establishment at Treforest.

* * *

The reopening of the Pathfinder Club premises at 115, Mount Street, Berkeley Square, W.1, after their recent "major" will be at 6 p.m. this evening, Thursday, October 7th.

* * *

The Royal Netherlands Air Force have now adopted as standard equipment "Stacatruc" fork lift trucks and other materials handling equipment manufactured by I.D.T., Ltd., of London.

* * *

On September 29th the first members of the Royal New Zealand Air Force crews who are to fly Dakotas on the Berlin air lift arrived at Heathrow. They will undergo a refresher course at Bassingbourne on local flight procedure.

"Seen anything of a couple of Beaufighters?"

* * *

Contrary to recent reports, it is now learnt that the American Air Force will not take over Bovingdon airport as a handling base. Another airfield is being sought having more hangar accommodation and better communications with London.

* * *

The 225th and last Mosquito has been delivered by the de Havilland Company in Australia to the R.A.A.F. The company's plant at Bankstown (N.S.W.) is now engaged on Vampire production.

* * *

Mr. Waywell, an Avro shop steward, recently asked Mr. Freeman, Parliamentary Secretary to the M.o.S., to collect a £5 bet from Mr. C. S. Lindgren who had wagered that the Tudor II would never receive a C. of A. A. V-M. Bennett's Tudor II was granted a C. of A. in September.

* * *

Mr. J. B. Chifley, the Australian Premier, announced on September 29th immediate restrictions on the use of aviation spirit to conserve funds of the Empire dollar pool; the restrictions do not apply to international airlines, but others will be limited to their monthly quotas as at July, 1948.

* * *

Twenty-seven British and Dominion M.P.s who attended the Commonwealth Parliamentary Conferences at Frankfurt recently were flown there from Blackbushe by Airwork, Ltd. After the return journey on October 3rd the party was to be landed at Turnhouse for a week's conferences in Edinburgh.

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Councillor H. S. Sirkett, J.P., the Mayor of Wembley, will, on October 13th, open the Wembley Civic, Industrial and Commercial Exhibition at the Civic Hall, Exhibition Grounds, Wembley, adjacent to the Empire Swimming Pool. Some 55 exhibitors will participate, showing a wide variety of machinery, photographic and cine equipment, electrical, radio and television appliances.

CIVIL AVIATION NEWS

Air Lift Doubled: B.O.A.C. Servicing Bases : Pan American Grace Operations

LONG-TERM PROJECT: Work will start on the Interim Terminal Buildings at London Airport at the end of this year. They will be situated on the north eastern side of the diamond-shaped central area which can be seen in this recent photograph. Mr. F. Gibberd has been appointed Consulting Architect for their construction, which is expected to be completed by 1951 for the Festival of Britain.

CIVIL CHARTER FLIGHTS TO BERLIN

BRITAIN'S civil fleet of air freighters, organized by the Charter Section of B.E.A. to supplement the work of the R.A.F. and the American Air Force in supplying Berlin by air, has doubled its numbers and more than doubled its carrying capacity since it began this operation on August 5th. Originally the fleet comprised 14 aircraft supplied by nine air charter companies and this has now grown to 28 aircraft belonging to 17 different firms, most of which are using double crews to keep up a day and night supply of food, coal and petrol. A further 13 aircraft have been chartered by B.E.A. and these should bring the total up to 41 machines; if necessary it should be possible to redouble the charter fleet by the end of October. B.E.A. say that this has become the biggest air charter operation of its kind, comparable only with the transport of refugees from India and Pakistan organized by B.O.A.C. last autumn. The total weight of supplies taken to Berlin up to September 25th was 15,926,000 lb including 8½ million pounds of foodstuffs, over 1,660 tons of coal and 493,500 gallons of petrol.

SKYMASTERS FOR PAKISTAN

FOUR Skymasters have been purchased from America for civil airline operation in Pakistan by Pak-Air, Ltd. The managing director of the company, Mr. H. Malik, recently passed through London on his way to California to collect the aircraft, with Capt. O. M. Ismail, Deputy Director of Civil Aviation in Pakistan, and the senior pilot of the airline, Commander J. B. Mirza. Mr. Malik is also a director of Pakistan Aviation, Ltd., a company comprising the Government of Pakistan, Orient Airways and Pak-Air. It is one of the objectives of the company to set up a major maintenance and overhaul base at Karachi that will be capable of handling 75 per cent of the Royal Pakistan Air Force's work besides the maintenance work of Orient Airways and Pak-Air. It is hoped to have this organization operating before the end of 1948. According to Mr. Malik insufficient attention has hitherto been paid to training of pilots and ground staff in Pakistan and this has necessitated obtaining crews from abroad. However, the civil airlines have now decided to organize flying clubs and engineering schools which should in years to come prove of great assistance both to the airlines and to the Air Force. Pak-Air, in addition to internal operations, hopes also to run services between Karachi and Colombo, Singapore and Cairo, by the end of this year.

B.O.A.C. MAINTENANCE ARRANGEMENTS

WORK on the transfer of the B.O.A.C. base from Dorval, Montreal, to England, is to begin in the middle of October. To maintain a daily service for the carriage of mails and freight during the transfer the reduced Constellation services, which will consist of three round trips a week between London and New York and one to Montreal, will be supplemented by three weekly Liberator services between London and Montreal via Prestwick. As the maintenance base at Montreal is progressively dismantled it will be necessary to service the Liberators elsewhere and Prestwick has been selected for this purpose. Throughout the winter Scottish Aviation, Ltd., who themselves operate Liberators and are therefore well equipped for handling the type, will undertake the maintenance of the B.O.A.C. fleet of Liberators. It is considered probable that, when the move is completed and when the new B.O.A.C. base at Filton is operating, the Liberators will be disposed of by the corporation to Scottish Aviation, Ltd. Engine overhauls during the changeover period will be carried out at the B.O.A.C. factory at Treforest, near Cardiff.

Following the purchase of the Lockheed Constellation maintenance base at Shannon by B.O.A.C. which was announced on September 27th, the equipment, which was paid for in sterling, will be moved to the U.K. This equipment will be divided between London Airport and the new base at Filton and will facilitate the servicing and maintenance of the Constellations purchased from Irish Air Lines and also the Constellations in use on the Atlantic route. The service depot at Shannon is fitted with the most modern machinery and machine shops and is suitable for servicing not only Constellations but other types of large aircraft.

CORPORATION'S LATEST TRAFFIC FIGURES

STATISTICS comparing the activities of the three Airways Corporations in June, 1948, with June, 1947, have been issued by the Ministry of Civil Aviation. These show that the aircraft miles flown altogether by B.O.A.C., B.E.A. and B.S.A.A. increased by 9 per cent, the passenger miles by 23.6 per cent, the mail ton-miles by 20.6 per cent and the freight ton-miles by 46.7 per cent. B.S.A.A. showed decreases of 12.2 per cent in the passenger miles flown and of 8.6 per cent in the freight ton-miles flown, although the actual number of passengers carried was higher. A slight reduction (6.1 per cent) was shown on the aircraft miles flown by B.E.A. this June compared with June, 1947.

For the first quarter of the financial year the total of over 19 million ton-miles was one-third higher than last year's figure for the same three months, the increase being rather more marked on internal than on international services. Quarterly freight traffic figures reveal that, on international services, which handle most of the freight business, the ton-miles flown by B.E.A. and B.O.A.C. exceeded by 75 per cent the ton-miles flown by these two Corporations in the same quarter of 1947.

PANAGRA'S 20TH ANNIVERSARY

PAN AMERICAN GRACE AIRWAYS, on September 13th, celebrated its 20th anniversary. During its 20 years of operations 640,000,000 passenger miles have been flown carry-

ing 715,830 passengers. The figures for last year totalled 106,691,000 passenger miles, carrying 111,607 passengers, and 13,780,614 ton miles of revenue traffic. From a four-passenger Fairchild which made the first flight on September 13, 1928, the fleet has grown to 52-passenger DC-6s with sleeper accommodation operating a daily schedule involving an elapsed time of 21 hours between Miami and Buenos Aires. In developing an air transport system where none previously existed P.A.G.A. constructed airports, installed its own radio and meteorological facilities, secured operating concessions and contracts from South American governments and even provided its own guest houses where hotel accommodation was lacking.

In 1942 the airline opened an all-cargo route from the Canal Zone to Lima; the success of this service led to its extension to cover the entire trunk line route. Last month this all-cargo service was expanded by 50 per cent with the addition of a regular scheduled DC-4 air freighter service. Shortly before Pearl Harbour when the various South American Governments caused the suspension of Axis-dominated airlines in South America, P.A.G.A. played an important part in avoiding an economic and transportation crisis by increasing its facilities to cover the vital routes. The airline recently received the Inter-American Safety Council's annual aviation award for the fourth consecutive year.

BREVITIES

PANAIR DO BRAZIL have opened a new service between Brazil and Switzerland with Constellation aircraft. The route will be through Lisbon to Zurich.

* * *

One of the York aircraft on B.S.A.A.'s service between Miami and Nassau has been equipped with G.E.C. fluorescent lighting. The main illumination is provided by 12 Osram 2ft, 20-watt fluorescent lamps in two parallel rows of ceiling fittings operating on a 110-volt, 400-cycle, 3-phase supply through a rotary converter in the aircraft's 24-volt circuit.

* * *

The frequency of the Air France service between Paris and Tunis is being stepped up from five return trips a week to a service each day. On September 1st the number of trips was increased from four to five a week. The new schedule includes a stop at Lyons. Languedoc 33-seater aircraft will operate the service.

* * *

July traffic figures for B.S.A.A. show that the passenger miles flown during that month in 1948 totalled 4,434,135, as compared with 3,637,026 passenger miles flown in July, 1947. The passengers carried amounted to 1,461, as against 1,214 in the same month of 1947; B.S.A.A. carried 318 more passengers in July, 1948, than in June, 1948.

* * *

As an incentive to efficiency B.E.A. ground engineers at Northolt recently commenced working on a bonus scheme basis. Time saved on jobs is valued in cash and this saving is divided between the employees and the Corporation, which allocates it for improvements to equipment. An average person should by this means be able to increase his earnings by about 15 per cent. If the scheme works satisfactorily it is to be introduced at other establishments of the Corporation.

* * *

On one single Sunday in September Trans World Airline flew no less than 1,701,555 passenger miles in Constellation aircraft. On the Los Angeles-New York service in August only one flight was late and that by about two minutes; on the westbound run on this route 24 out of 31 flights were completed exactly on time. The average delay on the remainder being only 1.3 minutes. T.W.A. report that its domestic Constellation flights completed 99.8 per cent of their scheduled mileage during July.

* * *

To improve high-speed communications between Pan American bases in New York and in Europe the airline has put into operation a transatlantic radio teletype system, giving instantaneous two-way communication between New York and Frankfurt, the centre of P.A.A. system in Europe. The new system can transmit 60 words per minute, and from Frankfurt messages can be radiated over the company's leased cable network to Shannon, Dublin, London, Brussels, Munich and Prague.

* * *

It is hoped that the B.O.A.C. Solents, which were withdrawn from service on the Springbok route between the U.K. and South Africa in June, will resume flying on this route early in October. The modifications, involving placing the wing tip floats further outboard, have been completed on the Solent *Sark* and this aircraft is now flying over the route before re-opening the service which, when resumed, will provide three Solent flights a week between Southampton and Vaaldam, the marine air terminal for Johannesburg.

* * *

Without having to cancel a single flight on account of weather, the B.E.A. and G.P.O. helicopter mail service in East Anglia has now completed its four months' experimental period. On only three occasions were flights behind schedule. One hundred delivery and collection flights have been made carrying a total of approximately 500,000 letters, cards and small packages. The experience and cost of the service will be reviewed to consider the practicability of regular helicopter mail operations in parts of the country sparsely served by railways. Experimental night flights are now being undertaken.

* * *

More than 1,233 tons of freight were carried on the overseas routes of B.O.A.C. during the first six months of 1948. This figure is nearly twice that for the corresponding period of 1947. The increase follows the introduction, in co-operation with Qantas Empire Airways and South African Airways, of special cargo services on B.O.A.C.'s routes from Britain to the Near and Far East, India, Pakistan, Australia and South Africa.

* * *

When making its circuit of Havel Lake on the Berlin run, a Hythe belonging to Aquila Airways experienced trouble with its port inner engine and completed the landing on three engines. The defective engine could not be rectified on the spot, so the aircraft took off on the remaining three engines and returned (with the port inner feathered) to Hamble, where the engine could be changed much more rapidly. This is the only instance experienced by Aquila Airways of unserviceability that could not be corrected by the flight engineers.

* * *

A new tourist service between New York and Puerto Rico was opened by Pan American Airways on September 24th. The new service, flown by DC-4s, leaves New York daily at 9.30 p.m. E.S.T., arriving in San Juan at 7.30 a.m., San Juan time; the northbound flight leaves San Juan daily at 10.30 a.m., arriving in New York at 6.30 p.m. The single fare is $75. By re-

NEWS BY AIR: Chinese script newspapers, printed in Hong Kong, are flown to Canton Airport by Hong Kong Airways where they arrive each morning for distribution.

Civil Aviation News . . . . .

moving a portion of the galley, each DC-4 on this route has been adapted to carry 63 passengers. Refreshments are served on both south- and north-bound flights.

* * *

Mr. L. M. Haybittel, freight manager of B.E.A., is leaving the Corporation at the end of October. Formerly a director and general manager of Wrightways, Ltd., Mr. Haybittel has had 20 years' experience of commercial freight both in the air and in road transport. During the 1914-18 war he served with the Royal Field Artillery and was awarded the D.S.O.

* * *

Special autumn and winter rates for round trip excursions were put into operation by T.W.A. on October 1st on their transatlantic sleeper flights; the first transatlantic all-sleeper service by an American airline took place on October 1st. T.W.A.'s new service leaves each Friday at 4 p.m. from La Guardia Airport and, including one stop at Gander, reaches Paris in 15 hours. The return flight leaves Paris on Sunday evenings, reaching New York at 8 a.m. on Mondays.

FROM THE CLUBS

PLENTY of experience in cross-wind landings has been gained by members of the West Riding Aviation Centre during the re-surfacing of the east-west runway at Yeadon airfield, since the prevailing winds during August were perversely east-west when the north-south runway had to be used. Bad weather cut down the hours returned in August to 23 hours of dual and 15 hours of solo flying. Four new flying members and five new ground members have now brought the centre's total membership up to 351.

* * *

SOME 80 members and guests attended the film show given at the South Coast Flying Club on September 4th by courtesy of the University Air Squadrons. Among the films shown was one produced by the Crown Film Unit showing the planning and carrying out of the Normandy invasion; the complete film show was produced and managed by F/L. J. Hall, of the Cambridge University Air Squadron. The "Farewell to the Squadrons" dance which was held at the club on September 17th included a cabaret provided by the University Air Squadrons, again under the direction of F/L. Hall, and was greatly enjoyed by all present.

* * *

MORGAN AVIATION, which commenced operations in December, 1947, at Cowes Airport, I.O.W., have recently moved to Bembridge Airport, on the eastern side of the Island. Bembridge has been extended and re-opened to air traffic, giving 100 acres with low, easy approaches. Morgan Aviation's activities include the operation of an air taxi service, provision of aircraft for club flying and the running of pleasure flights for the many holiday-makers visiting the district. The club house at Bembridge has a licensed bar and provides meals for visitors, and Morgan Aviation wish it to be known in club circles that they are independent of Somerton Airways and have moved to Bembridge as a separate concern.

* * *

WITH the object of ensuring co-ordination of flying control and insurance at all flying rallies and displays the management committee of the Leicestershire Aero Club has decided to request the attendance of a Royal Aero Club steward whether the event is organized by clubs or individuals. The committee has also recommended that landing cards should be transferable from one aircraft to another; it is contended that the present system is unfair to an owner whose aircraft becomes unserviceable and who therefore uses another machine. Braunstone Airfield, the old home of the pre-war County Flying Club, now amalgamated with the Aero Club, has been de-requisitioned. Pending negotiations for the lease of this airfield to a local charter firm, with facilities for local flying organizations, the Leicestershire club has decided to remain at Ratcliffe for the next 18 months.

* * *

FLYING hours at the Midland Aero Club this summer have exceeded by over 300 the hours completed last season, in spite of indifferent weather this year. Membership continues to increase and prospective membership also appears promising. Recent Saturday patrols included visits to Cowes, where members enjoyed a cordial welcome, and also to Newquay. An informal dance was recently held at the White Lion Hotel, Portway, which proved so successful that the committee have decided to make this a regular monthly event. On Friday, October 8th, the annual ball will take place at the Grand Hotel, Birmingham. The traditional bonfire and firework display will celebrate November 5th. The clubhouse is now open seven days a week and Tuesday evenings have been chosen for various entertainments, such as quiz competitions, film shows and brains trust meetings.

* * *

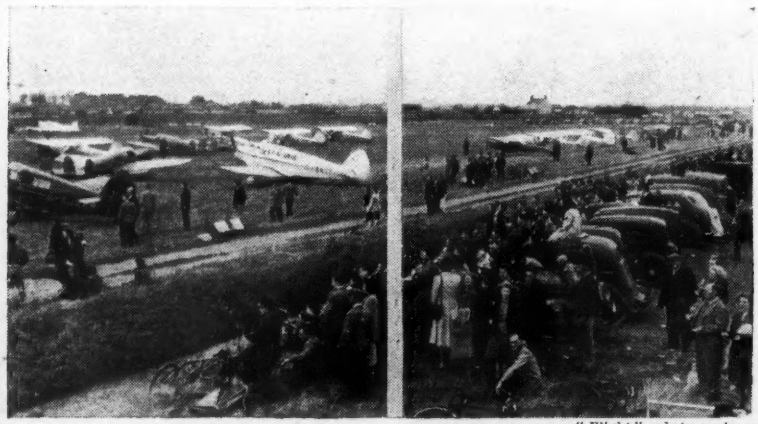
A LARGE number of members and their friends attended the Bristol and Wessex Aeroplane Club's "at home" on September 25th. The programme was carried through without a hitch in excellent weather and, besides demonstration flights of numerous aircraft and formation flying by pilots of No. 12 R.F.S. in Tiger Moths, included a single-lap sprint race for Auster aircraft. This was from Whitchurch to Lulsgate and back and was won by S/L. E. M. H. Slade in a Lycoming Auster, with Miss Chapman, of the Hereford Aero Club, in an Auster G-AIJY, coming second, after starting from scratch; there were seven entries. W/C. H. Kerr and S/L. D. Cubitt, of No. 12 R.F.S., performed an entertaining exhibition of crazy flying in two Tiger Moths. The 21st birthday of the club is being celebrated on October 22nd with an aviation ball to be held at the Grand Spa Hotel, Bristol, for which tickets are priced at 15s. each.

* * *

DURING the first year of operations at Hereford Airfield, opened on September 18th, 1947, the total number of hours flown from the airfield was 1,716 and the total number of passengers carried was 1,728. The membership of the Hereford Aero Club is now 251, of which 49 are flying members; during the year members of the club have visited most of the main clubs in the Midlands and South of England. Efforts are being made to get the Air Ministry interested in providing a V.R. Squadron to operate from Hereford Airfield in view of the publicly expressed need for recruits.

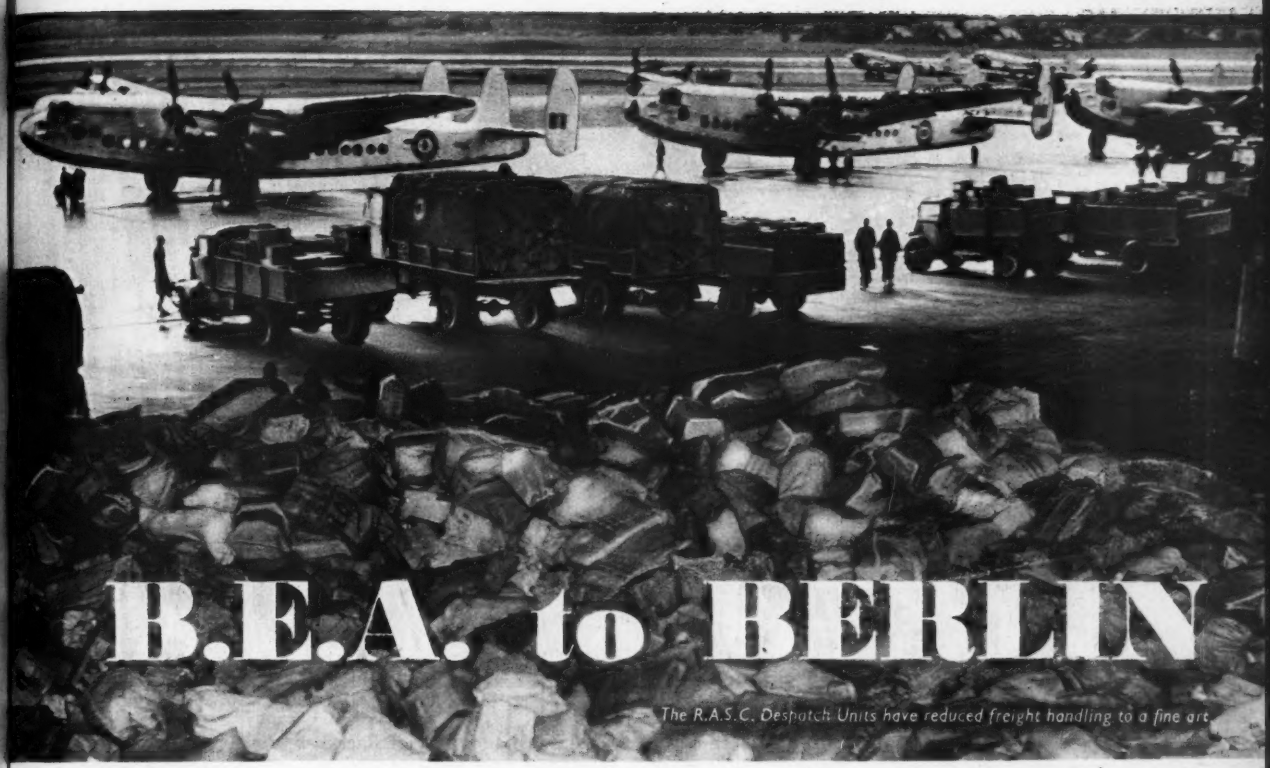
* * *

SINCE the flying charges of the Cardiff Aeroplane Club have been reduced to £3 per hour for dual and £2 per hour for solo flying there has been a marked increase in hours logged, especially those flown solo. The club's "at home" was held during August in brilliant weather and proved a great success. S/L. D. Cubitt gave a display of aerobatics and the C.F.I., Mr. G. Kemp, provided humorous events. The programme, which was limited to club aircraft, also included target shooting, bombing and a display by an Olympia sailplane. Members of the Cardiff Model Aircraft Club staged an interesting programme and the day was concluded with a social evening in the club house.



"Flight" photograph.

EAST COAST WEEK-END: Many pilots took advantage of the fine weather to spend an enjoyable "48"—the last of the season—at Butlin's Ingoldmells airfield, near Skegness. The Sunday afternoon flying programme included demonstration parachute drops by Territorials and regulars who were also Mr. Butlin's guests for the week-end. Notes appear on page 433.



B.E.A. to BERLIN

The R.A.S.C. Despatch Units have reduced freight handling to a fine art

Part 2—Visits to Gatow Control, Wunstorf and Lübeck : Soviet Aircraft Encountered

By H. F. KING, M.B.E

Illustrated by "FLIGHT" photographs

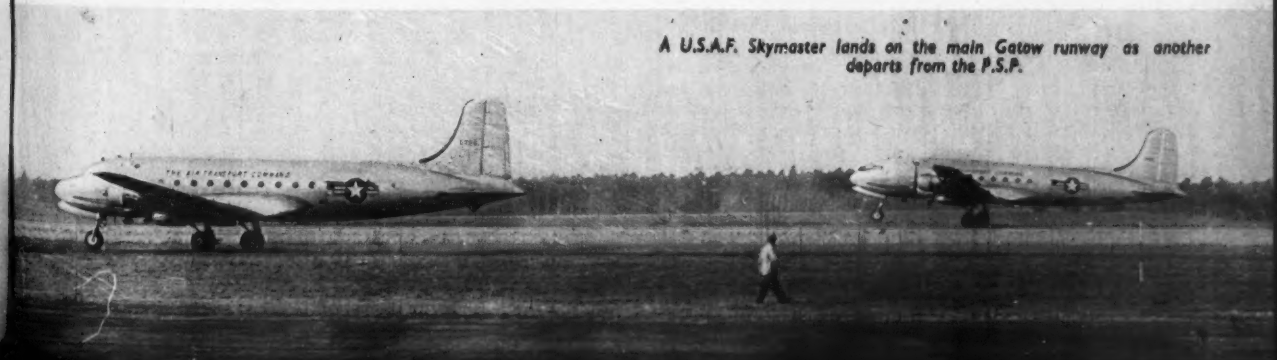
September 23rd (Continued)

Group Captain Yarde paid warm tribute to the personnel under his command—especially the "erks" who are putting up such a great show under active-service conditions. He had a word, too, for the R.A.F. Regiment, now engaged in marshalling aircraft—a duty which, compared with many other commitments which normally fall to the lot of the "Regiment," they find congenial.

The Wing Commander Flying explained the present system of operation, whereby traffic from the Northern Axis flies along the Hamburg corridor, and that from the U.S. Zone, or Southern Axis, down the Frankfurt corridor, all aircraft departing by way of the Buckeburg corridor. These corridors are 20 miles wide, and aircraft are phased to arrive in waves, so that a regular flow is maintained through each 24 hours.

Air Lift planning is the responsibility of A.H.Q., B.A.F.O. and Transport Operations, in conjunction with the U.S.A.F. Wonderful smoothness has been achieved. Each stream of aircraft is allocated a height at which to fly; thus, the civil machines from Fuhlsbüttel (as we had experienced) come in at 1,000ft A.S.L., as do the flying boats from Finkenwerder; the Yorks from Wunstorf fly at 1,500ft, at intervals of four hours; the U.S.A.F. Skymasters from Fassberg at 2,500-3,500ft, every four hours; the Dakotas from Lübeck at 4,500ft at the same interval; and the passenger-carrying Dakotas from Buckeburg at 6,500ft (no block times). As an indication of the tempo of operations, W/C. Piper told us that for fifteen days past there had been an average runway movement once every two minutes or less, day and night. On U.S. Air Force Day, when the Americans (who operate roughly one-third of the aircraft using Gatow) were making a special effort, 451 *landings* were recorded in 24 hours.

Having interviewed the Station Commander and Wing Commander Flying, we questioned S/L. A. B. Haskell, Chief Technical Officer, concerning the turn-round speed of Service aircraft operating from Gatow. The touch-down /



A U.S.A.F. Skymaster lands on the main Gatow runway as another departs from the P.S.P.

B.E.A. to BERLIN . . .

take-off time for a York, he said, is 40 minutes by day and a few minutes longer by night. Minor technical snags are fixed while an aircraft is unloading, and if major rectification is necessary—which is unusual—the machine is quickly pulled out of line.

G/C. Yarde found time to conduct us personally to the control tower and to introduce us to S/L. P. F. Varey, Senior R.A.F. Controller, whose temporarily stiff arm, we were assured, was the result of a mosquito bite and not controller's elbow.

The principal facilities provided in Gatow tower are V.H.F. Approach Control and V.H.F. Airfield Control (Universal Airfield Control). Equipment includes a Eureka beacon (in addition to a similar beacon at Frohnau), Babs, M.F. beacon, H.F./D.F. and V.H.F./D.F. The R/T operators record all traffic between Control and aircraft, and the G.C.A. director and talk-down frequencies are monitored. All V.H.F. equipment used for the facilities mentioned is duplicated, and a change from one set of apparatus to the other is made every 12 hours. Two Air Traffic Control Assistants and special-duty Clerks record every air movement in and out of Gatow, for reporting to the Berlin Air Safety Centre in the Allied Control Authority.

A Tower watch consists of three Air Traffic Control Officers, each of whom is trained in the alternative functions of Approach Controller, Universal Airfield Controller and Supervisor, and it is the practice, every five or six hours, to interchange jobs, thereby minimizing boredom. The entire watch works as a team, so that all R/T patter is familiar.

Special procedure is necessary for controlling the American aircraft. As soon as the first machine of a Skymaster block in the Gatow pipeline calls at a 20-mile check-point, control is handed over by the R.A.F. to the U.S. approach controllers, and as each aircraft reports over the Frohnau beacon it is taken over by British airfield control. A few French Dakotas are using Gatow, and a French warrant officer is available for tower duty. Control has been greatly facilitated by the use of standardized R/T patter and procedure introduced by W/C. Piper, in which all unnecessary verbiage is eliminated.

Chatting with S/L. Varey, we witnessed three take-offs and one landing in two minutes. The time was 11.00 hrs. Since 02.00 hrs. 155 landings had been logged, with approximately the same number of take-offs. During August there were 8,951 landings and 8,917 take-offs and in one night thirty-three G.C.A. landings were recorded.

From Control we saw the vast airfield constructional work in hand at Gatow and watched half-a-dozen Yaks gambolling in the direction of Staaken.

Out on the airfield once more, officers of a detachment of an Airfield Construction Wing, under S/L. Jennings, told us how rubble is being collected from the bombed areas of Berlin, laid at Gatow, and surfaced with macadam —likewise ripped from the streets of devastated areas, and "cooked up" with a 5 per cent admixture of tar and bitumens to give body. The hard-standing now being laid is some 74,000 sq yd in area—greater than the average 1,500-yd runway. All laying is done by hand, by corps of Germans, many of whom live in the Russian sector, with numbers of women among them, working 12 hours a day. Another undertaking is the building of a link track;

U.S.A.F. Skymasters stream nose-to-tail round the taxi track.

Avro Yorks and a Bristol Wayfarer pause briefly at Gatow.

with the aid of an autobahn mixer and paver, this is being completed with amazing dispatch, several hundreds of yards having been completed in the past few days.

Some relief from the dust and noise of the airfield was afforded by the austere but efficient Malcolm Club canteen—part of a hangar—where British, American, South African, Australian, and French crews may be seen queueing for a hasty mug of tea and a "wad" before taking off for the next load. Here we met Captain E. Cæsar-Gordon, who readily agreed to give us a lift to Wunstorf in a short-nosed Viking IA of Trans-World Air Charter, which he had just brought in, on his first lift, with 7,000 lb of sugar.

Enthroned on the only available seat—that in the steward's pantry—we looked forward through the empty shell of the Viking's fuselage, void of all furnishings, but with planks arranged on the floor to take the concentrated load. A Hythe flying boat sailed across our bows as we left Gatow on a trip, which, with its nauseating bumps and general discomfort, seemed to last every minute of its hour. The geodetic wings were visibly flexing, and the Viking wagged her tail till we fervently wished we had paid no heed to Captain Cæsar-Gordon's well-meant advice to fill up with doughnuts before taking off.

We were glad, indeed, to see the two B.E.A. liaison officers at Wunstorf—Messrs. Jack Lukin and Robin Atkinson—who, in the few minutes available, told us what we needed to know of air lift activity at their end. From Wunstorf, all the civil charter aircraft—with the exception of the Dakotas—are supplying Berlin. To see the Haltons and Lancastrians really getting down to an overtime job was to realize that, whatever may be said in discredit of British "interim" aircraft, we may be profoundly thankful that these old warhorses were available when the call came from Germany. Bristol 170s at present in service are ex-passenger-carrying Wayfarers, but R.A.S.C. Air Despatch Units, who are responsible for all loading (and a really wonderful job they are making of it), look forward to the arrival of "pukka" Freighters, for which cargoes can be prepared on trays to permit rapid nose loading.

There was no time to study the work of the R.A.F. at Wunstorf (Station Commander G/C. Whitley; Wing Commander Flying, W/C. Hanks), but the sight of dozens of Yorks operating *en masse* was a revelation.

Having missed a Flight Refuelling Lancastrian tanker for our return trip to Gatow, we were grateful to Captain C. Treen, of Bond's Air Services, for arranging a passage in one of his company's Haltons, flown by Captain R. M. Jones. Captain Treen has done over 50 lifts himself (mention has already been made of one of his best efforts), and swears by the ex-B.O.A.C. Haltons, with their underslung panniers, as freighters for the carriage of concentrated loads. It was he who proved the type on the Civil Air Lift, and he hopes to have three or more similar machines in the near future.

A few days previously Captain Jones had seen nine Russian fighters approaching from his starboard beam. He pushed down his Halton's nose, and they passed close above.

To the accompaniment of *Music While You Work* on the R/T, we set course for Gatow with a cargo of flour, at 170 knots indicated, height 1,500ft. The weather was fair, and the windscreen rapidly became obscured by flies which, observed Captain Jones, sometimes accumulated to such a density that vision is really seriously impaired. We passed the airfield at Dedelsdorf (though apparently unused by aircraft, this is the site of a beacon) and, before entering a rainstorm, which served to wash the blood from the windscreen, noticed a York "pouring on the coals" to starboard. Emerging from the shower we clearly saw the barges at Wittenberge, waiting to lift the blockade.

Silver City Wayfarers and Flight Refuelling Lancastrians at Wunstorf.

Rubble from Berlin is used for the new hard-standing at Gatow.

Squadron Leader P. F. Varey, R.A.F., Senior Controller, in the Gatow Tower

G/C. B. Yarde (right), W/C. T. W. Piper (centre) and S/L. A. B. Haskell at Gatow

B.E.A. to BERLIN . . .

As the Halton entered the Berlin Approach Control area we picked up a call from a Bristol Wayfarer, now flying in line with us low to starboard. A Service York was flying parallel to port, and, in line-abreast, our little formation was nearing Gatow when a twin-engined aircraft was seen closing on us quickly from ahead. It was evidently of the Dakota family, and painted green. Heading towards the York, it appeared to pass much too close for comfort to the august Avro, which steadfastly maintained its course. A red star showed clearly on the tail.

Having glimpsed the new airfield in the French zone, which should be ready by Christmas for the use of the Western Powers, we were obliged by two aircraft ahead to make a circuit of Gatow before touching down at a weight of some 56,000 lb.

From the Halifax we transferred, for the run up to Lübeck, to Dakotas of Air Contractors, Ltd. (Capts. A. H. Boyd and R. B. Miles), just arrived with carrots and flour, pausing only to allow two pale and ageing women to sweep the floor of G-AIWE, in which Capt. Miles was flying his 73rd lift. At 5,500ft, G-AIWE, leading a block of civil and R.A.F. Dakotas, cruised up the Buckeburg "exit" corridor at an easy 130 knots. Icing had already been encountered on a previous flight at the 5,500ft level, and the crew expected that the set altitude would soon be reduced. Formerly the Dakotas flew at 1,000ft, from which height it could be seen that the Russians had removed one track of the double-track railways in their zone. (It has since been reported that these are now being replaced.)

Friday, September 24th.

B.E.A. liaison officers at Lübeck, from which dozens of R.A.F. Dakotas operate in company with civil "Daks" of seven charter companies, are Messrs. J. P. Theobald and H. F. Smallman. These officers told us this morning that the civil machines are averaging three, and the Service aircraft two, trips daily. Having missed a sortie yesterday, Kearsley Airways were proposing to put in four to-day., Ciro's G-AKJN, for which two crews are available, has completed its 138th lift since August 6th.

As aircraft become serviceable, crews are briefed for their sorties in a Nissen hut known as "Dak Detail." On the notice board was an instruction (forecast yesterday) that the operating height on the Gatow run had been reduced to 4,500ft. This, we learned, was to lessen the risk of cumulus and ice. Warning also came that Yaks would be flying in the corridor to-day up to 2,500 metres; airfields mentioned were Elstal, Kothen, Brandenburg, Perleburg, Zerest and Dalgow. At Dolle, slightly off the Dakotas' track in the corridor, air-to-air and air-to-ground firing would take place.

We were unable to meet G/C. F. W. H. Hall, the Station Commander, but the Wing Commander Flying (W/C. G. H. Gatheral) and W/C. A. Hodgson, in charge of the Technical Wing, gave us some details of Lübeck's part in the supply of two-million-odd Berliners.

Having completed two trips, each R.A.F. Dakota crew has 12 hours off duty; the routine is repeated once, and

"Dak. Detail" at Lübeck during a quiet period.

W/C. G. H. Gatheral, Wing Commander Flying (left) in Lübeck Tower.

Sustaining the inner men: Malcolm Club Canteen, Gatow.

B.E.A. to Berlin . . . . .

is followed by two more trips and a "36." This schedule is maintained until, after 13-14 days, the crew is sent home on five days' leave. In addition to ten R.A.A.F. crews under S/L. Greenwood, a number of S.A.A.F. pilots are operating. The senior air traffic controller is F/L. Allenby, who has dispensed, we noticed, with telephones in the control room. These often prove a serious handicap to the officer on duty.

Having been present at Horsham St. Faith when the eight Meteors, with two Halifax tenders, left for Denmark recently, we were especially interested to see one of the Halifaxes come into Lübeck on its return trip. The Meteors had passed through on the previous day. We wondered if the Halifax pilot appreciated the risk he was running in parking his machine with the civil Dakotas; it would hardly have been surprising if the Army had descended on the machine and stuffed it with flour sacks.

To Capt. T. Freer, of Westminster Airways, and Capt. Bover, of Air Transport Charter (Channel Islands), Ltd., we were indebted for lifts back to Gatow during the afternoon. Capt. Freer's radio operator told us that on the preceding trip Dakota G-AJAZ had met four Yaks some fifteen minutes before reaching the Frohnau beacon. The fighters passed below, and Capt. Freer warned the W/O. to observe the proceedings from the astrodome. One Yak was seen to detach itself from the formation and close in on the Dakota's tail until it was "two or three Dak. lengths" astern, finally breaking away below.

On our own trip, with some twenty minutes to go to the Frohnau beacon, we heard prop ice impinging on the fuselage, leading Captain Freer to remark that weather is likely to be the principal factor affecting the continuance of the air lift from Lübeck on its present scale. Hangar accommodation is seriously inadequate, and the bitter winter winds will inevitably tell on the maintenance staff.

We had already been cleared at the 20-mile check point to descend to Angels 2, and were, in fact, nearing the Frohnau beacon, when someone was heard to remark, apropos Russian aircraft, that he was not sure whether to keep his eyes skinned or shut. By keeping our own open we were rewarded by the sight of a vic of three Pe-2s closing in from port a few miles ahead. They turned to bring themselves more or less on our track, and as they slowly drew away, cruising, we judged, at some 160-170 knots, the number three machine of the formation started to emit a very noticeable smoke trail from its starboard engine. As these twin-engined attack bombers left us a red-starred LI-2 (Russian Dakota) crabbed below our machine, presumably on its way in to Schönwalde.

Back at Gatow, some difficulty was experienced in taxying, a York having burst a tyre on the link track. Such casualties are not allowed to interrupt for long the flow of aircraft to and from the hard-standing area, and in an hour or so the track was free. Once again we found the Tudor I. Yesterday, said Captain Store, he had managed to get in four trips, carrying 20,600 lb of bean flour on each.

In the little time remaining we looked in at the Gatow Malcolm Club, where Miss Mary Dyson told us how the canteen detachment on the airfield is giving 24-hour service. Each evening five telephone calls to England are available to "other ranks" at 5s. We also noticed before leaving Gatow the two Avro 19s maintained by the Comm. Flight, one for R.A.F. use and one for the C.C.G.

Airborne on the return trip in Viking *Verily*, Captain P. A. Dorehill was so kind as to send word by the steward that we were free to go forward. Flying up the left side of the Elbe the Viking's position was reported to Bad Eilsen, and we were soon turning above Harburg to approach Fuhlsbüttel over vast tracts of devastation, forming, in the rainy gloom of approaching night, as depressing a scene as we could recall. Incongruously, a few white-sailed yachts were manœuvring.

At 10,000ft, having cleared Hamburg on the final leg, and after a first-rate B.E.A. dinner of meat, salad, flan, cheese, pickles and coffee, we awaited the first signs of London. The steward switched off the cabin lights to allow the luminous grandeur to be fully appreciated, and we thought of the darkness two hours' flying behind us.

FROM D.H.'s CAMERA

SIR GEOFFREY DE HAVILLAND is not unknown as an entomologist—hence the names of a line of aircraft starting with the famous Moth—but few people know that another absorbing interest in life for him is to take a camera on safari into the game reserves of Africa.

At the Ilford Gallery, 101, High Holborn, London, W.C.1, there is now open an exhibition of his big-game photographs. The pictures are superb and most varied. Elephants, lions, giraffes, rhinos, zebras and various buck are all portrayed singly and in groups—sometimes from as near as 15 yards.

In addition to big game there are also excellent close-ups of local inhabitants—some being very attractive!; and a number of interesting shots of birds and a swarm of locusts in Kenya.

The photographic quality is excellent, and for those interested, the lens, shutter speed and aperture are indicated on many of the pictures.

The exhibition, open until November 30th, is free.

THE STAR TIGER MYSTERY

THE disappearance of the B.S.A.A. *Star Tiger*, H-AHNP, on January 30th, 1948, on a flight from the Azores to Bermuda, remains as deep a mystery as ever in spite of all the efforts of the Court of Investigation ordered by Lord Nathan while he was Minister of Civil Aviation, and presided over by Lord Macmillan. The Court's report was issued as a White Paper (Cmd. 7517). It runs to 46 pages plus appendices.

All possible evidence was collected by the Court, but nothing emerged which could give a clue as to the actual cause of the disappearance of the aircraft. Many possible causes were considered and evaluated; they were divided into those which could be eliminated and those which could not. But even in the case of the latter, the report states that "the Court has not been able to do more than suggest possibilities, none of which reaches the level even of probability." It concludes: "What happened in this case will never be known, and the fate of *Star Tiger* must remain an unsolved mystery."

Star Tiger left Bermuda at 3.34 p.m. on January 29th, having been preceded by another B.S.A.A. machine, a Lancastrian, which took off at 2.22. The Lancastrian reached its destination, but the last signal from *Star Tiger* was sent out at 3.15 a.m. the next morning, after which nothing more was heard of or from it. Both flew at about 2,000ft. During the flight the wind conditions did not correspond with those forecast and there was a fairly large northerly drift.

The Court criticizes the wireless operator at Bermuda for failing to declare an emergency until 95 minutes after the last contact with the aircraft. "His attitude during the 95 minutes following lack of contact was not consistent with the spirit in which an Air Guard should approach his duties."

Certain recommendations are made by the Court, all of which have been dealt with by B.S.A.A. "Most of them were put into effect before the enquiry opened," a Corporation statement claims. This would rather tend to show that the Corporation was aware that certain aspects of the operation of the route were open to improvement.

BUTLIN'S AIR RALLY SEASON ENDS

INGOLDMELLS field at Skegness was the venue of air guests attending the last Butlin weekend of the season. A representative gathering of private pilots and their crews spent a pleasant weekend—September 25th-27th—at the camp, and, due to the eleventh hour withdrawal of Service aircraft support, virtually provided their own air meeting for the entertainment of the campers and other visitors on the Sunday afternoon. In spite of the high wind, drops were made from a balloon-hoisted cage, the balloon men from Cardington being accompanied by their C.O., G/C. J. Bradbury, D.F.C. Instructors from No. 1 Parachute Training School, Upper Heyford, and men of the 16th Airborne division of the Bradford Territorials made the jumps. They were commanded by Col. G. H. Lea of the 12th Yorks Battalion and S/L. Blythe of No. 1 School. Capt. A. MacBain gave an excellent commentary. In addition, there were height and speed-judging competitions, a treasure hunt, spot landing contest and an aerobatic display. A photograph appears on page 428.

A large number of flying people have enjoyed Mr. Butlin's hospitality at one or more of his camps during the year, and they will look forward to meeting again during the 1949 season.

Canadian Tailless

Details and Performance of the N.R.C. Glider

AS a complement to the work initiated in this country during the war, the National Research Council of Canada also undertook the design and construction of a tailless glider at the National Research Laboratories. This undertaking has recently received prominence by the towed flight from Edmonton, Alberta, to Arnprior, Ontario, a distance of 1,780 miles which, it is believed, constitutes the longest flight of a glider of this type.

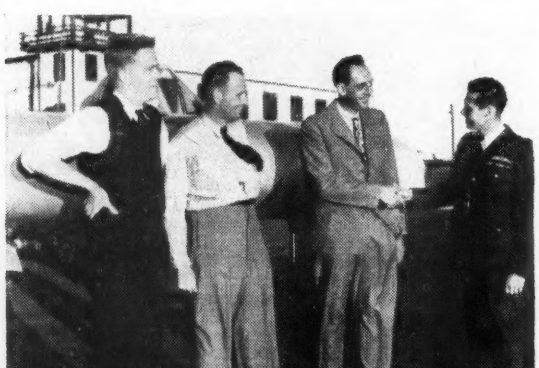
Despite fundamental similarity in concept and size, the Canadian glider differs in many detail respects from the General Aircraft gliders with which tailless research has been undertaken over here. We assume that, under the "all for one and one for all" spirit of the Commonwealth Aeronautical Research Council's avowed purpose, the total knowledge gleaned from the flight trials in this country with the G.A. tailless gliders has been placed fully and unreservedly at the disposal of the National Research Council in Canada.

The N.R.L. glider has a U-plan wing with a span of 46ft and a length of about 18ft. An original flying weight of the order of 3,700lb gave a wing loading of 10lb/sq ft, so that, at the maximum weight of 4,150lb at which the glider has been flown, the resultant wing loading would appear to be in the region of 11¼ lb/sq ft. The primary structure is entirely of wood, a single laminated spar forming the spine for conventional chordal ribs carrying a relatively thick moulded-plywood skin. The surface finish is stated to be good and remarkably free from distortion.

Separate individual cockpits are used, and to mitigate damage in the event of an emergency landing with the tricycle undercarriage retracted, skid shoes can be extended to bear the brunt of the landing shock. Primary flight control is vested in elevons and end-plate fins and rudders, whilst additional control adjustment for pitching moment is given by adjustable wing tips, the incidence of which can be changed as required through a screw jack. Flaps of conventional split type are employed. Instrumentation is comprehensive, and automatic recording is made of the following data: time; airspeed; altitude; tip angle; flap angle; sideslip; rolling rate; pitching rate; yawing rate; elevon hinge moment; elevon angles; rudder angle; ambient air temperature; normal acceleration; longitudinal acceleration; attitude (gyro and pendulum); angle of bank.

In addition, a wire recorder on the ground takes the pilot's and observer's radio transmissions throughout the tests, and so provides an accurate and permanent record of their observations. The instrumentation, which has functioned very satisfactorily, has made possible a programme of concentrated test flights.

During its three seasons of operation, the glider has flown a total of about 100 hours, of which the first 30 were devoted to handling trials. The initial handling trials were made by the late S/L. Robert Kronfeld, A.F.C., R.A.F., but the subsequent flights have been made by S/L. E. L. Baudoux, D.S.O., D.F.C., F/L. G. S. Phripp and F/L. G. A. Lee, all of the R.C.A.F. Mr. T. E. Stephenson, in addition to being in charge of the glider team, has also been the scientific observer during flight trials; incidentally, the pilot occupies the port cockpit and the observer the starboard cockpit. The flying operations have been carried out by the Winter Experimental Establishment of the R.C.A.F., and in order to take advantage of the exceptionally long runways there, all the flight trials have been made from Namao Airport, near Edmonton.



Shaking hands are F/L. C. F. Phripp (extreme right) and Mr. C. S. Levy, National Research Council, on the arrival of the N.R.L. tailless glider at Arnprior, Ontario, from Edmonton. On the extreme left is Mr. T. E. Stephenson, N.R.C., with F/L. G. A. Lee. F/L. Phripp and F/L. Lee piloted the glider.

Operational Practices

The ground-handling qualities of the glider are good. No taxying difficulties have arisen, and with its differentially operated wheel brakes, the aircraft is easy to control. Take-offs have been made at speeds between 70 and 90 m.p.h., the take-off run ranging from 2,600 to 3,150ft; there is, apparently, no advantage in unsticking at a speed below 90 m.p.h. A nylon tow-rope, 350ft long, and a R.C.A.F. Dakota have been used for towing, the normal towing speed being 100 m.p.h., although 140 m.p.h. has been achieved in level flight without difficulty. The free flight characteristics of the aircraft in general are good; control, for the most part, is said to be easy and natural. The range of flight speeds from 55 m.p.h. to 150 m.p.h. has been investigated with a range of c.g. positions from 50 to 55 per cent of the centre-section chord. Normally, the glider is towed to an altitude of 6,000 to 10,000ft, after which it glides down in 10 to 15 minutes. Testing is discontinued at an altitude of about 4,000ft in order to permit getting into position for landing. Approach speed is 85 m.p.h. and the normal landing speed 60 m.p.h., but landings have been made at speeds varying between 50 and 75 m.p.h. The approach in landing is simple and straightforward; there is no tendency to float, bounce or swing, and spot landings can normally be made consistently with an error not exceeding 200ft.

During the flight trials, valuable records have been obtained which will be analysed during the coming winter and the information issued in report form. It is expected that the experience and information obtained during the trials will form a valuable contribution to the knowledge of this type of aircraft.

BOOK REVIEW

How and Why it Works. Published by Odhams Press, Ltd. 9s 6d.

CUTAWAY drawings and photographs in conjunction with lucid, not-too-technical descriptions give readers an insight into the workings of more than a hundred subjects, ranging from pianos and printing presses to refrigerators and hot water systems, and telephones and traffic lights. Aviation is represented by sections on aircraft, aero engines, airports, helicopters, turbojets and radar, and though understandably brief, these give accurate and interesting explanations. People of all ages, interested in the mechanical things in everyday use around them, should find "How and Why it Works" full of information of absorbing interest.

Some Economic Factors in Civil Aviation

The Annual British Commonwealth and Empire Lecture by Peter G. Masefield Before the Royal Aeronautical Society

INTRODUCING his paper, Mr. Masefield said that, after the Crown, long-range transport was the most significant of all ties which bound the British Commonwealth and Empire into a community of free peoples. Of all the forms of transport which thus enlaced the Commonwealth, air transport was at once the swiftest and the most capable of development. He quoted Paul McGuire's description of the Commonwealth: "The nearest man has yet approached to achieving a world community. It offers a framework on which a system of world order could be built." That was the great conception in which air transport was privileged to play a dominant part.

Mr. Masefield had chosen his subject because he believed most sincerely that operating economics must be the foundation of all our progress in commercial aviation. To succeed, civil aviation had to be able to support itself financially. The purpose which air transport should be designed to serve was all too often confused or ignored. The essential contribution which air transport had to make was improved communications, which led to traffic robbed from older and less convenient forms of transport, and new traffic created by the new need. In order to attract traffic on which its revenue depended, air transport must aim, he said, to offer superior, that is, more convenient, carriage of passengers and goods than any competitive means of transport. To be fully effective in its underlying purpose of improving communications, air transport must be safe, swift, regular, frequent and cheap. It must provide those three Rs of all means of transport: Reliability, Regularity and Revenue.

Discussing subsidies and the profit and loss account, Mr. Masefield remarked: "Precisely how much civil aviation is costing the world at present is difficult to estimate, although we do know that the total turnover of the airlines of the world has now reached about £1.5 million per day and that they provide employment in one way or another for some 500,000 people. The profit and loss account of British civil aviation shows that there is a gap estimated at about £28 million a year between the direct income and expenditure. This £28 million (2½d. on the income tax) is the real subsidy price which we are having to pay for the building up of a national Civil Aviation which will mean as much to the nation in the future as the mercantile marine has done in the past.

On the subject of safety, the lecturer said that although air transport must be made much safer yet, the problem was one of economics and not of sentiment. The same applied to the other factors, since the most economic aircraft in the world was of little value unless it attracted traffic. Major civil airlines had never yet operated at a profit if all concealed and unconcealed subsidies were deducted. The reason for the uneconomic nature of long-range operations had been that profits from excess of revenue over direct operating costs had never been sufficient to meet overheads. The two contributory reasons for this were that aircraft had not been able to carry sufficient payload to show an adequate margin of revenue over operating costs, and that overheads had tended to be high because of pioneering and development, and the relatively small scale of business hitherto.

To achieve the purpose of improvement in communications economically there were four basic requirements: efficient aircraft—economic to operate; efficient operators—devoid of crippling overheads; an efficient ground organization—meaning adequate airports, and adequate air traffic control; and an airfaring outlook—on the part of the public which has to support civil aviation. The lecturer considered the last to be probably the most important of the four. One of the best ways of achieving it effectively was through the national encouragement of light aeroplane flying, gliding and aeromodelling. Given the four requisites, air transport could contribute to national prosperity and wellbeing through the revenue derived from air travel and increased trade through improved communications; security as a result of the manufacturing potential; and through them to international solidarity.

Referring to the status of air transport, Mr. Masefield mentioned that the traffic carried on British airlines in 1947-8 was 40 per cent greater than that of the previous year, growing to 41.6 million aircraft-miles and 627,000 passengers carried for 470 million passenger-miles. In the United States between 1938 and 1946 passenger-miles flown on domestic air services had increased by 990 per cent, and passenger-miles flown on international services by 1,780 per cent. This was a healthy sign, but the progress of commercial aviation had nevertheless been retarded by one factor above all else. This was the so-called safety standard. Quoting American statistics as evidence, it was pointed out that for the year 1946 a passenger would have had to travel 560 million miles on U.S. airlines before he would have been killed, i.e., 1.8 deaths per thousand million passenger-miles. On a comparative basis with other forms of transport, the statistics for the two-year period 1944-46 per thousand million passenger-miles were: omnibuses, 1.9 deaths; passenger trains, 2.1 deaths; scheduled airlines, 17 deaths; motor cars and taxis, 27 deaths. Of all the fatal accidents to scheduled transport aircraft in 1947 (a bad year) 1 per 50 million aircraft-miles—40 per cent occurred during approach and landing in bad weather.

A concentrated attack on the problem of bad-weather landings and of producing a non-spinnable private aircraft, combined with a campaign against low flying, would have most valuable results in improving the safety record. "My own view," said Mr. Masefield, "is that we shall have to come to a system of automatic landings for all transport aircraft."

On the table (overleaf) of the operating statistics of six international airline companies, Mr. Masefield remarked that even in these difficult times there are airlines which can show a surplus of revenue over operating costs, although admittedly a portion of the revenues are in the form of mail subsidies. The best margin of profit was 9 per cent of the turnover, whereas one airline showed a loss of 40 per cent. The average figure came out at a loss of about 6d per aircraft mile

A NATIONAL BALANCE SHEET
(Estimated figures)

Debit	Millions		*Credit*	Millions	
1. Operating Costs ...	£30	(42%)	1. Operating Revenues ...	£23	(32%)
2. New Civil Aircraft Production	£17	(24%)	2. Aircraft Sales (Home) ...	£13	(18%)
			3. Aircraft Sales (Export) ...	£5	(7%)
3. Research and Development (Including new prototypes)	£9	(13%)	4. Charges for Technical Services	£2	(3%)
4. Technical Ground Services (Air traffic control, lighting, navigational aids, etc.)	£8	(11%)	5. Credit to be made nationally against: (a) Provision for future revenues (b) National trade and communications (c) Political and diplomatic services (d) National prestige and security	£28	(40%)
5. Airport Construction and Maintenance	£5	(7%)			
6. Administration (Salaries and accommodation) ...	£2	(3%)			
Total Annual Debit... ...	£71	(100%)	Total Annual Credit ...	£71	(100%)

Deficits :—

(a) Airport construction and maintenance programme plus technical services	£11 Million
(b) Operational Loss on Air Services	£7 Million
(c) Research and Development	£9 Million
(d) Administration	£2 Million
Total Deficits	£29 Million*

*The difference between the sum of the deficits and the amount by which the revenues fall short of expenditure is accounted for by an estimated profit of £1 million on aircraft sales.

Some Economic Factors in Civil Aviation . . . . .

flown or a loss of 2d per ton-mile of payload carried. Further inspection emphasized the well-known fact that a profit can be gained only by associating a reasonably high revenue load factor with low overheads and high aircraft utilization.

Overheads at present were running at rather more than half the total operating costs, the average for the six airlines being 54.5 per cent. The target figure of 33 per cent for overheads must be achieved much more widely if profits are to be made. Some people would be surprised to see that the total operating costs average more than £140 per aircraft-hour flown, of which £65 per hour was direct costs and the other £78 overheads. Mr. Masefield then went on to analyse six selected contemporary types of aircraft—a Rapide, Dove, Dakota, Ambassador, Constellation, Orion (hypothetical) and Brabazon.

Brief reference was made to the general principles of operating standards, and Mr. Masefield pointed out that there were an unconscionable number of variables which appeared when an attempt was made to assess the operational performance of any aircraft over any particular route. Such factors as the amount of fuel and payload carried, local temperature, conditions at the airfield and the safety standard adopted and the varying conditions of weather over the route, in addition to the subsidiary variables inherent in the aircraft type. Nevertheless, amidst this inconstancy there were three main operating standards which could be applied to all commercial airline services in greater or lesser degree. The first was reliability, the second regularity, and the third punctuality, all three being interdependent, and in all three the chief operational factors to be contended with were low visibility and the wind.

When the basis on which the required degrees of reliability (100 per cent), regularity (minimum of 95 per cent) and punctuality are examined, the predominant requirement is found to be sufficient fuel to cover all contingencies. Having established the basis for determining the tankage required for a new aircraft, or the routes over which an existing aircraft could be operated, the next step was, Mr. Masefield said, to discover the factors which would set the amounts of fuel required for scheduled operations at the required regularity. Whatever the regularity, the main object of the airline was to carry as much payload as possible over the route at the highest frequency which the traffic would bear. Thus, any estimate of the performance characteristics and of the economic possibilities of an aircraft flying on a particular route must be founded on an established average payload carried per trip throughout the year, a calculated average block-to-block speed over the route throughout the same period, and an estimated annual figure for the amount of fuel consumed. An analysis of those three factors in terms of the operating standards already discussed raised the problems, he said, of advanced payload booking and the influence of passenger "load factor"—the percentage of seats filled to seats offered—on the practical results. The problem was to determine months ahead the maximum payload which could be offered for sale on a route in the light of headwinds which must be anticipated, and the regularity desired.

The Philosophy of the Booking Payload

From an operating point of view, the traffic department of an airline must know in advance what payloads can safely be offered for sale on a particular route on a particular day regardless of wind or weather. Overbooking, said Mr. Masefield, meant that payload would have to be off-loaded, or fuel restricted, which might mean that the aircraft could not take-off and regularity would be sacrificed to maintain safety. Conversely, a severe restriction on the amount of payload, revenue, and hence economy, would be sacrificed. For these reasons the calculations of the maximum payload which could be booked in advance were extremely critical. The booking payload was the payload which could be sold months ahead for a particular type of aircraft on a particular route

OPERATING STATISTICS FOR SIX INTERNATIONAL AIRLINES DURING RECENT 12 MONTH PERIODS

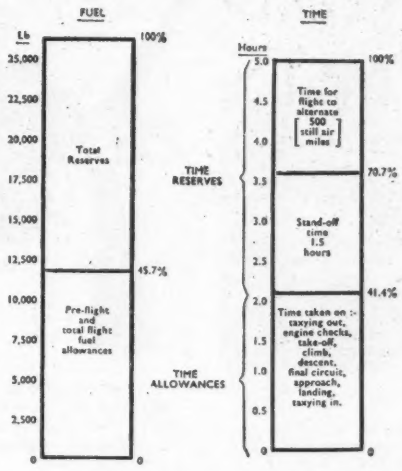
Annual Items	Units	Airline "A"	Airline "B"	Airline "C"	Airline "D"	Airline "E"	Airline "F"	Average of Airlines "A" to "F"
Revenue miles flown per aircraft	Miles per year	539,000	490,000	458,000	244,000	180,400	150,000	343,500
Revenue ton miles of payload per aircraft	Ton miles per year	1,780,000	1,700,000	1,380,000	540,000	300,000	290,000	1,000,000
Revenue load factor	per cent	58.33	66.65	62.25	73.20	58.00	64.70	63.86
Revenue earned per aircraft	£ per year	£449,000	£405,000	£315,000	£140,000	£86,000	£74,000	£245,000
Revenue per aircraft per mile	Shillings per mile	16s 7d	16s 6d	13s 9d	11s 6d	9s 6d	9s 10d	14s 3d
Revenue per ton mile of payload	Shillings per ton mile	5s 0d	4s 8d	4s 7d	5s 2d	5s 4d	6s 1d	4s 11d
Service hours flown per aircraft	Hours per year	2,530	2,855	2,040	1,380	892	864	1,760
Block to block speed made good	m.p.h.	213	172	225	176	202	174	195
Tons of payload carried per aircraft per mile	Tons per a/c mile	3.3	3.47	2.87	2.23	1.67	1.93	2.9
Operating cost per aircraft	£ per year	£413,000	£434,000	£340,000	£134,450	£79,000	£120,700	£253,520
Operating cost per aircraft hour flown	£ per hour	£164	£151	£167	£97 6s	£88 10s	£140	£143
Operating cost per aircraft per mile	Shillings per mile	15s 4d	17s 6d	14s 10d	11s 1d	8s 9d	16s 1d	14s 9d
Operating cost per ton mile of payload	Shillings per ton mile	4s 8d	5s 0d	4s 11d	4s 11d	5s 2d	10s 0d	5s 5d
Profit or loss per aircraft	£ per year	Profit: £36,000	Loss: £29,000	Loss: £25,000	Profit: £5,550	Profit: £7,000	Loss: £46,700	Loss: £8,520
Profit or loss per aircraft hour flown	£ per hour	Profit: £13	Loss: £10	Loss: £13	Profit: £4	Profit: £8	Loss: £54	Loss: £4 10s
Profit or loss per mile	Shillings per mile	Profit: 1s 3d	Loss: 1s 0d	Loss: 1s 1d	Profit: 0s 5d	Profit: 0s 9d	Loss: 6s 3d	Loss: 0s 6d
Profit or loss per ton mile of payload	Pence per ton mile	Profit: 0s 4d	Loss: 0s 4d	Loss: 0s 4d	Profit: 0s 3d	Profit: 0s 5d	Loss: 3s 11d	Loss: 0s 2d
Direct operating costs per aircraft hour	£ per hour	£71 8s	£57 15s	£82 0s	£65 0s	£51 9s	£65 0s	£65 8s
Indirect operating costs per aircraft hour	£ per hour	£92 12s	£93 5s	£85 0s	£32 6s	£37 1s	£75 0s	£78 2s
Revenue percentage of operating costs	per cent	108.0	93.5	92.5	104.1	109.0	61.4	97.0
Direct costs percentage of operating costs	per cent	43.5	38.0	49.0	66.9	58.0	46.5	45.5
Indirect costs percentage of operating costs	per cent	56.5	62.0	51.0	33.1	42.0	53.5	54.5
Revenue percentage of direct costs	per cent	248	246	189	156	186	131	213
Indirect costs percentage of direct costs	per cent	130	162	104	50	72	115	120
Average length of stage flown	Statute miles	1,015	1,010	902	612	1,200	678	903
Average hours flown between landings	Hours per landing	4.76	5.85	4.0	3.41	5.94	3.91	4.63
Number of landings made per aircraft	Landings per year	530	487	507	400	150	221	381
Average size of aircraft used	Tons gross weight	37.4	32.7	34.0	21.1	29.0	20.0	29.0
Tons of payload carried per aircraft	Tons per year	1,755	1,690	1,530	880	250	430	1,104

Some Economic Factors in Civil Aviation . . . . .

and could be varied with the time of year on certain routes to meet fluctuation in wind and traffic. The target regularity was the minimum regularity of take-off which could be accepted for satisfactory schedule operation, and a figure of 95 per cent had been taken as a reasonable objective.

The variables are such that eleven points modify the apparent regularity and influence the actual regularity achieved. They are:

(a) The effects of cruising procedure on the payload/range characteristics of the aircraft.
(b) Fluctuations in traffic in relation to frequency—influencing the fuel load which can be carried.
(c) The effect of passenger load factor on booking payload—again modifying the fuel load.
(d) Possible variation in cruising height to gain more favourable winds on particular occasions.
(e) The influence of navigational techniques on effective route winds, particularly the development of "pressure pattern" navigation, which alters the shape of the "effective headwind probability curve."
(f) The effect of mechanical unreliability—both of the aircraft and of ground services, such as radio aids.
(g) Meteorological influences, other than wind, which cause delays or diversions, e.g., fog, ice, snow on runways, and so on.
(h) Traffic congestion in the circuit, causing delays or diversions.
(i) The distance which has to be covered to the alternates and the possibilities of route diversion.
(j) The human element and the allowances which have to be made for variation in operating performance on the part of aircrews.
(k) The number of landings made during a given utilization—(each landing increases the possibility of delays).



Typical total allowances and reserves—Orion 1.

The booking payload can be allowed to change over different seasons in sympathy with fluctuations of seasonal traffic demands and with varied frequencies; as a result a lower booking payload may be feasible in the most adverse season, and in consequence an improved seasonal regularity may be possible. The lecturer also spoke of the importance of the development of pressure pattern navigation which was "the application of the technique of the trade winds to the air."

Summarized, the booking payload was the total payload available after fuel had been taken on board for the "pre-flight allowances," for the "flight allowances," for the necessary reserve and for the completion of the flight cruising at height against the wind component which in a typical analysis was not exceeded on 85 per cent of occasions in the worst season. Ideally, the booking payload should be closely related to capacity payload for economy on the scale: The actual sold payload was, he said, the booking payload modified by the application of the achieved load factor.

Operating Costs

Having established the operating performances for a range of aircraft, the meaning of their performances in terms of operating costs and revenue possibilities remains to be determined. Can a flight from "A" to "B" in prevailing wind conditions and with a practical scale of overheads, be performed economically? And if so, what are the typical figures for an annual operation?

In the opinion of the lecturer there was only one satisfactory way of assessing likely economic results from particular aircraft operating over particular routes. That was to analyse the operating costs and the revenue potentials over a full year, taking into account the essential parameters of overheads, stage length, achieved block time, utilization and number of aircraft in a fleet. It had already been established that the cost of aircraft operation depended largely on three things:—

How much the aircraft is used in a year (utilization).

How long it flies between landings (stage length, cruising speed and wind), and

To what extent it is saddled with overheads (administrative efficiency).

Revenue, on the other hand, depends directly on the amount of payload which can be attracted per mile. The costs incurred can therefore be divided into:—

(a) Those annual costs which arise irrespective of hours flown.
(b) Costs which are dependent directly on hours flown (e.g., fuel and oil).
(c) Costs associated directly with take-off and landings (e.g., station costs, landing fees, etc.).

Mr. Masefield submitted that operating costs fell more naturally under three independent heads rather than under the heads of direct and indirect costs familiarly quoted. The three heads were:

I. FIXED ANNUAL COSTS—independent of hours flown or miles covered.

II. HOURLY CRUISING COSTS—the direct flying costs per hour of utilization, at the rate of cost incurred when cruising at operating height.

III. TAKE-OFF AND LANDING COSTS—depending on the average stage lengths flown in a defined period. They are the extra costs associated with each landing and take-off cycle over and above the costs associated with cruising height.

The totals of operating costs summed under these heads depend directly on the overhead expenses, the hours flown and the number of landings made in a year. With the addition that revenue is governed by the miles covered and the load factor achieved, the fundamental conception is stated. Individual airlines have their own methods of estimating operating costs. The lecturer said that he was attempting to set down a realistic method of compiling estimates on a generalized basis readily applicable to any aircraft, the results of which when combined with parallel estimates of revenue would be comparable rather than quantitative for different types of aircraft. The costs governed by the various influences could be divided into 38 items.

Returning to the breakdown of known costs for the six airlines, and making allowance for a slight unbalance on the high side due to two of the operators, it could be estimated that fair figures for the respective totals per ton of gross weight for piston-engined aircraft in the present state of scheduled airline development was:—Fixed Costs —£3,500 per annum; Hourly Costs—£1 15s per hour flown; Take-off and Landing Costs—£4 10s per operating cycle of landing and take-off.

(To be continued)

FIXED ANNUAL COSTS
(Independent of hours flown and miles covered)

1 Amortisation of airframe.
2 Amortisation of engines.
3 Amortisation of propellers.
4 Amortisation of radio.
5 Insurance of aircraft.
6 Interest on capital invested in aircraft.
7 Engineering base overheads.
8 Amortisation of ground equipment.
9 Interest and insurance of ground equipment.
10 Salaries and pensions of administrative staff.
11 Headquarters accommodation.
12 Administrative office expenses.
13 Accommodation at out stations.
14 Technical development and flying training.
15 Advertising and publicity.
16 Traffic and sales.
17 *Total Fixed Costs.*

HOURLY CRUISING COSTS
(Direct flying costs incurred over the full utilisation period at the rate of cost incurred while cruising at operating height)

18 Fuel consumed cruising at height.
19 Oil consumed.
20 Maintenance of airframe (cruising).
21 Maintenance of engines (cruising).
22 Maintenance of propellers.
23 Maintenance of radio.
24 Salaries and expenses of cockpit crew.
25 Salaries and expenses of cabin crew.
26 Insurance of crew.
27 Insurance of passengers.
28 Air service for passengers and crew.
29 *Total Hourly Cruising Costs.*

TAKE-OFF & LANDING COSTS
(Additional costs associated with each landing and take-off cycle, from operating height to operating height)

30 Extra-to-cruising fuel used on take-off and climb.
31 Extra-to-cruising maintenance of airframe.
32 Extra-to-cruising maintenance of engines.
33 Extra-to-cruising maintenance of propellers.
34 Extra-to-cruising maintenance of radio.
35 Landing fees.
37 Out station operation.
38 *Total Take-off and Landing Costs.*

Three-heading breakdown of operating costs.

COMPOUNDED POWER UNITS

Wright Turbo-Cyclone to be Put into Production

RECENTLY released news that the eighteen-cylinder Wright "Turbo-Cyclone" engine is included in a substantial contract placed by the U.S. Navy marks the first instance of a compounded power unit being put into production. A variety of engines of this interesting type have been built experimentally and several are still undergoing development. They represent not so much an attempt to bridge the gap between the piston engine and the turbine as a method of further increasing the efficiency of the piston engine to the stage where it can effectively compete with the turboprop unit for aircraft designed or specific operating conditions.

The general case for the compounded engine may, very briefly, be outlined as involving relative specific weights and specific rates of fuel consumption. A conventional piston engine scales about 1 lb./h.p. whilst the turboprop unit weighs, say, 0.75 lb./h.p. On a 10,000 h.p. installation the net saving of weight would thus be 2,500 lb. Moreover, in a specially designed craft, reduced engine weight would also permit substantial saving in the airframe structure weight and together the total saving might be of the order of 7,500 lb.

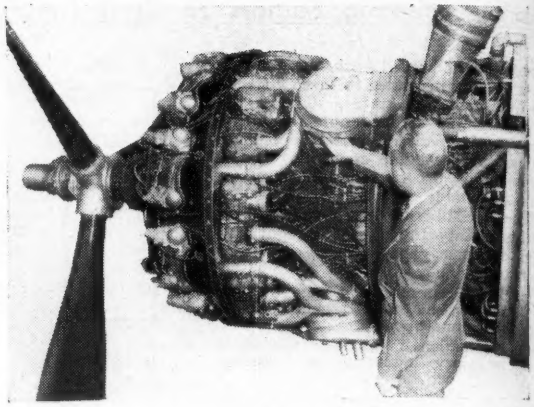
Against this must be offset the fact that a piston engine is thermally more efficient than the turbine and thus has a lower specific fuel consumption. Obviously, if the thermal efficiency of the piston engine can be raised without material increase in weight it will still show to advantage over the turboprop unit for aircraft intended for long range duties.

A number of methods of increasing the power output of a piston engine are known and used, but little further can be expected in raising the efficiency by a process of increasing pressures. This would be likely to involve an increase in the specific weight of the unit and, in turn, of the airframe. Accordingly the line of approach is to recover some of the energy which is normally lost by way of the exhaust pipe. About 50 per cent of the potential heat energy of the fuel used is discharged as exhaust. As there are other losses on the engine (conduction, radiation and mechanical losses), the potential energy lost in the exhaust is greater than that delivered at the engine shaft. On the Wright "Cyclone," for example, it is estimated that for 1.0 h.p. delivered at the shaft, 1.5 h.p. is lost at the exhaust. Not all this potential energy can be recovered—again an estimated figure is about 20-25 per cent—but the exhaust represents the largest single avenue of loss and thus offers the greatest scope for recovery.

Compounding Systems

Systems of exhaust gas turbines feeding power back to the engine shaft may, in general, be divided into two main classes although there are a number of minor variations possible and a combination of the two classes has been tried. In the "blow-down" system individual pipes conduct the exhaust directly from the engine ports to the turbine entry. Thus the gas can expand relatively freely and there need be no increase in exhaust gas pressure. This avoids adverse effects on engine power output and cooling. In the alternative "steady pressure" system the exhaust gases of a number of cylinders are delivered to a common chamber where a pressure is maintained and thence pass to the turbine. Obviously, the pressure in the exhaust port cannot fall below that in the chamber and, to some extent, a back pressure is exerted on the engine.

The "blow-down" system shows to advantage at low altitudes and the "steady pressure" system is preferable for high altitudes. It would seem a "steady pressure" system can be best exploited on an engine specially designed or adapted for the purpose whilst the "blow-down" turbine can more effectively be installed on an existing fully-developed engine. The use of "blow-down" and "steady pressure" turbines in combination can realize good performance at both low and high altitudes and at the same time maintain a low rate of fuel consumption. At 30,000ft a consumption of 0.32 lb/b.h.p./hr. has been quoted for an experimental engine. With this method the efflux from the "blow-down" turbine is collected and delivered to the "steady pressure" turbine which may be geared back to the engine or used to drive a first-stage supercharging blower or other auxiliary unit.



The latest Wright Turbo-Cyclone 18 compounded power unit for long-range aircraft which is to be put into production for the U.S. Navy. Two of the three blow-down exhaust turbines can be seen. A possible range increase of up to 20 per cent is claimed.

The Wright Turbo-Cyclone uses the "blow-down" system with six cylinders feeding gas by separate pipes to each of three turbines. To avoid piping and radiation losses the turbines are mounted as closely as possible to the exhaust ports. The assembly is remarkably compact and apparently adds nothing to the overall dimensions of the engine. The Wright Corp. claim that this engine will add 20 per cent to the average range of existing aircraft.

It will be recalled that Allison produced a compounded unit embodying a "steady pressure" turbine geared to the engine shaft and also driving a first-stage blower through a variable-speed hydraulic coupling (*Flight*, Sept. 25, 1947 and Jan. 29, 1948). This experimental project was abandoned as, after extensive studies, it was decided during 1946 that the time and energy required to develop it to the production and operational stages could be more profitably employed on the turboprop unit which offered greater potential advantages.

It is possible that other than technical considerations have influenced the decision to produce the Wright Turbo-Cyclone.

PENETRATION FIGHTER: This classification has been adopted by the U.S.A.F. for what were formerly known as "escort" or "long-range" fighters. Illustrated is the newest machine in this class—the McDonnell XF-88, with twin axial-flow turbojets, ejecting beneath the fuselage.

GAS TURBINES in the UNITED STATES

Impressions of a Tour of American Gas Turbine Plants and Laboratories : Progress Analysed

By Dr. P. F. MARTINUZZI

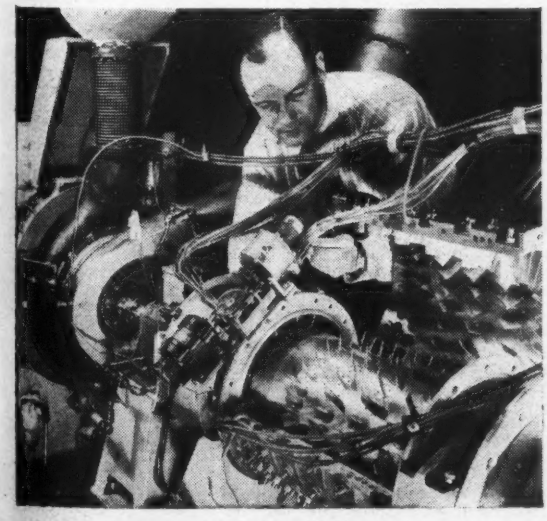
DURING his ten-week tour in America, with the help and sponsorship of the American Society of Mechanical Engineers, the author was offered exceptional facilities for getting into contact with gas turbine experts. He gave eleven lectures on gas turbine developments, at widely separate centres from Boston to Los Angeles, and on these occasions was able to hold discussions with many people. He reports that, in their usual friendly fashion, the Americans were extremely helpful, and the amount of information gathered was very large. Below is an appreciation, prepared specially for "Flight," in which Dr. Martinuzzi summarizes the overall picture he formed.

The purpose of the tour was to obtain details of calculation methods, general trends, and of the direction which gas turbine research is taking, rather than to obtain specific information on models now in production. Many of the talks were "off the record," so that in some cases only the outline can here be recorded.

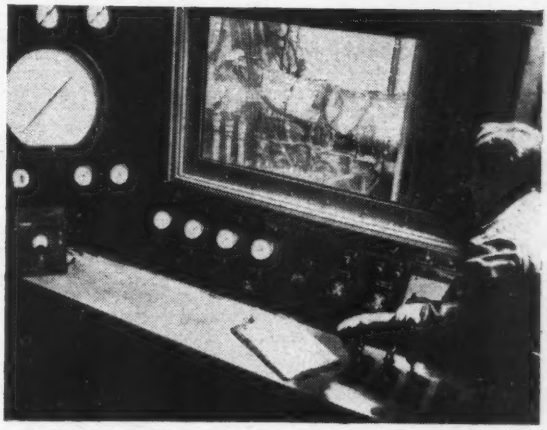
TURBOJETS

AMERICANS are making a truly colossal effort in developing their jet engines. This applies both to improvements to existing types and to the production of new prototypes and models. The sums of money spent on development work both for the Army and the Navy are enormous; one cannot help thinking sometimes that a little more time and a little less money would, in the long run, bring better results more quickly.

As is well known, most of the American jet engines actually in use employ the axial compressor; the types with centrifugal compressors are being abandoned. This seems a pity, because it appears that the axial compressor types which have replaced the earlier centrifugals are not more reliable, are heavier and "several times" more expensive. The "several times" was quoted to the author by a prominent engineer belonging to a world-famous firm; he would not specify the ratio, but apparently it was quite high!



Compressor-blade tests at the Boeing plant.



A small axial-flow Westinghouse unit on test for the U.S. Navy.

This neglect of the centrifugal compressor is almost a matter of principle; a desire to disclaim British influence may contribute to it; and many American engineers are not in agreement with this policy. Apparently, the main objection to the centrifugal is the relatively low efficiency obtained at high compression ratios (about 76 per cent at 4:1). The American engineers themselves admit, however, that these low efficiencies are not inherent in the centrifugal compressors; they are connected with the particular design used which could obviously be very much improved.

It is curious to note, as will be seen later, that the designers of industrial turbines are, on the contrary, very seriously considering the centrifugal type; and, of course, Pratt and Whitney are building the Rolls-Royce Nene under licence.

A striking and rather unexpected fact about the development of the axial compressor is the lack of co-ordination and co-operation between the different firms. Not only do they use different types of calculation methods, but even the philosophy underlying some of the more extreme types of American bladings varies a lot from firm to firm. This is probably due to the lack of a strong, centralized gas turbine centre. Of course, this lack of co-ordination has its good points, in that new and daring ideas can be tried out, and seem often to be quite successful. But the method is necessarily rather wasteful, because these differences apply not only to basic research, but continue down to prototypes and production types; obviously, some types are better than others, but they are not necessarily those which get the largest orders.

Available Data Neglected

Although theoretical work of the highest possible quality is being done, in the laboratories of firms, of institutions such as the N.A.C.A. and of some universities, the general trend is to tackle the problems independently of past experience and of what competitors are doing. Very little reference or knowledge of what is being done on the Continent of Europe seems to be prevalent among gas turbine designers, except what can be gathered from the old book by Keller.

The British data, particularly those contained in the five Institution of Mechanical Engineers lectures, are better known, but not very widely used. Relatively little use is made even of data provided by American laboratories, and there seems to be little reference or knowledge of American papers and books, some of which are excellent.

Some of the people engaged in very responsible work are amazingly young, and the fact that they have been able to tackle the problems unencumbered by experience or prejudices seems to have been, on the whole, very helpful.

Largest among the turbojet producers are, of course, General Electric and Westinghouse; General Electric has greatly extended its Lynn, Mass., factory, which is a really impressive place; and Westinghouse has a very large new laboratory provided by the United States Navy. In both places keen, alert engineers are doing a lot of work which goes far beyond the existing types. Very much larger thrusts are being aimed at;

and the new jets will have to work at very high altitudes. This implies a lot of research, both in compressor design and in combustion; the compressor must provide the very large amount of air required, and combustion must continue even at very high altitude. The variation in intake density provides an added problem for the compressor; although every effort is made to obtain a very high pressure rise per stage, in some cases the number of stages for a given compressor ratio has been increased purely in order to obtain a flatter characteristic curve and consequently better operation at varying densities. The need to improve fuel economy has brought about a general tendency to higher compression ratios.

Other firms are preparing new jet models. Northrop-Hendy, at Los Angeles, seem to be particularly advanced in their design; they have an excellent team of young engineers and apparently are preparing a very powerful engine. At the other extreme, Boeing, of Seattle, have specialized in very small jets suitable for models and pilotless aircraft. From a conversation with the Boeing engineers it appears that they started a few years ago with practically no previous knowledge, and simply got on with the job; beside their well-known model centrifugal-type jets, they are now developing an axial compressor.

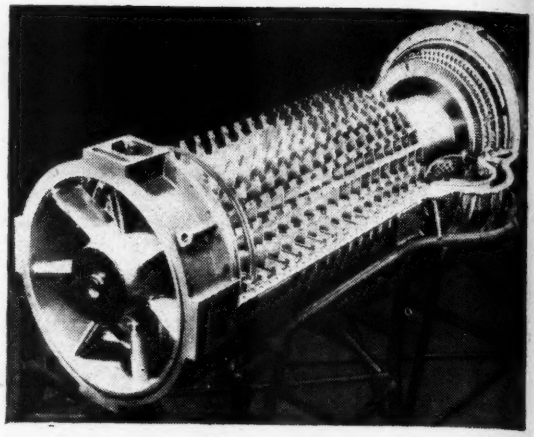
A rather disquieting series of accidents has recently happened in America; they can most easily be explained by the fact that the turbojet engines have burst in flight. Although at the time of the author's leaving no official report was issued, engineers generally attributed the accident to the second prototype Northrop flying-wing eight-jet bomber to an explosion in a jet engine; apparently the aircraft disintegrated in the air and burst into flames before reaching the ground, which seems to substantiate this theory. The wide use of cast materials for turbine bladings and the very high temperatures at which jets are run might provide an explanation.

TURBOPROPS

ALTHOUGH a very great deal of work is being done on turboprops in America, the day when they will be used normally either on commercial or on military aircraft seems rather far away. There are two reasons for this. First of all, while it is relatively easy to make a reliable turbojet engine, it seems extraordinarily difficult to make a reliable turboprop. The trouble lies mainly in the reduction gear and in vibration trouble in the turbine and compressor blades.

It seems strange at first that the reduction gear, which works very satisfactorily with the variable torque and the many vibrations of piston engines, should give trouble with a smooth running power plant of the turbine type; but in a piston engine the crankcase and the whole engine are rigidly built to withstand the alternating stresses; while the rigidity of an aircraft turbine is very moderate and cannot easily be increased without prohibitive weight. Consequently, the whole machine is exceedingly sensitive to any outside source of vibration; for instance, the blading vibrations are mainly due to frequencies fed into the rotor by the reduction gear or, more often, by the airscrew; every time a blade passes along the leading edge of the wing, an unbalanced force is originated and these are fed to the gears and to the blades. Vibrations can be set up even by slight differences in combustion of the multiple combustion chambers.

Balancing the compressor for a very small experimental Westinghouse gas turbine.



Northrop-Hendy's Turbodyne has an annular combustion chamber between an axial-flow compressor and multi-stage turbine.

In turbojet engines, owing to the self-regulating properties and the variable speed, vibrations are very much less troublesome, apart from the fact that there is no airscrew or reduction gear. But turboprops must work within very close range of r.p.m., and this causes trouble. For the same reason, the regulation of turboprops is more difficult than that of turbojets.

All these problems have not found a satisfactory solution and turboprops are consequently very erratic and unreliable; but even if they were reliable they would remain very unsatisfactory. The fuel consumption of the turboprop is still far too high to make it a really serious competitor of the piston engine for moderate-speed aircraft.

The trend in America is towards a definite improvement in economy by means of very high compression ratios and high temperatures. This trend has sometimes been carried to ludicrous extremes; one model had apparently a compression ratio of 35 : 1; needless to say, the compressor was not very successful! But the Americans are seriously contemplating the use of compression ratios of 12:1; they are also working feverishly on some satisfactory form of lightweight heat exchanger, although the progress seems to be very modest.

In the long run, the greatest improvement will probably come from increases in maximum temperature, which will be discussed under "Research." General Electric, Westinghouse, Northrop-Hendy, and other firms are all engaging in turboprop work. The general opinion is that the Northrop is a very nice job indeed, and powerful enough to bring it outside the competition of even the largest piston engines.

ROCKETS

ON rockets a tremendous amount of work is being done, both for auxiliary purposes and as primary motors. Most of it is, of course, highly confidential; but there is no doubt that a lot of money and great ingenuity are being spent to improve the rocket engine. Some of the developments required by the rocket may be of great assistance to the ordinary gas turbine. For instance, cooling the outlet nozzle of a rocket motor is a very ticklish problem indeed; and the metallurgical developments which were needed to solve it might be of great help in providing better turbine blades.

RESEARCH

A CONSIDERABLE amount of research is of course carried out in the laboratories of the firms. But the long-range research is made principally at the N.A.C.A., at university laboratories, and other similar institutions. The United States

Gas Turbines in the United States . . .

Navy has its own laboratory for marine turbines at Annapolis. The N.A.C.A. has, as is well known, several distinct laboratories, of which the one at Langley Field deals with aerodynamic research and the one at Muroc Field with supersonic speeds. Of greatest interest for gas turbine engineers is, however, the N.A.C.A. laboratory at Cleveland, where all propulsion problems are studied. The money and equipment available are colossal; but it is interesting to note that N.A.C.A. is more or less a Government institution, and its employees are Civil Servants; so the salaries actually paid are very low compared with those usual in American industry, while the money available for equipment is practically unlimited.

N.A.C.A. does a lot of work on compressor bladings, on supersonic compressors, on heat exchangers, on combustion, etc. The most interesting and promising side of the work is probably that on very-high-temperature turbines. The results already obtained are startling to say the least, and the N.A.C.A. engineers are confident that in a few years' time extremely high temperatures will be permissible in gas turbines; the figure of 3,000 deg F (1,650 deg C) is, according to them, within the possible range.

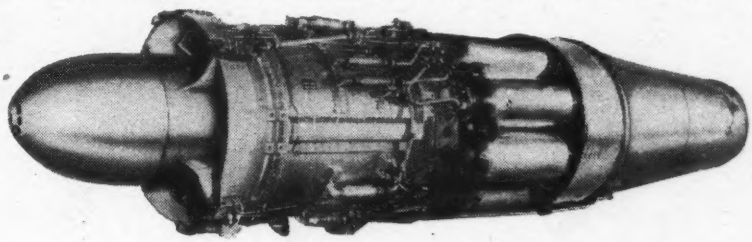
There are several ways of obtaining this result—direct cooling, sweat cooling and ceramic coating—and all of them are being considered by the N.A.C.A. engineers. If this research programme were to give practical results even within ten years, it would probably constitute the greatest single step forward in the development of the gas turbine. Even a temperature of 2,000 deg F (1,100 deg C) would increase considerably the economy and decrease the size of the gas turbine both for aircraft and industrial uses. Among other bits of impressive equipment, the Cleveland laboratory had in advanced construction, at the time of the author's visit, a supersonic tunnel to test full-size jets.

Even taking into account the inevitable amount of duplication and dispersion that accompanies these large-scale research plants, there is no doubt that the effect of the N.A.C.A. work on gas turbine progress is very considerable indeed. But it must be noted that many industrial firms do not pay very much attention to what N.A.C.A. or any other laboratories are doing; this is due to the lack of co-ordination and co-operation already noted above.

There are so many laboratories and research institutions working on gas turbines and rockets that it would take too long to mention them all. The new $500,000 M.I.T. laboratory in Cambridge, Mass., is very impressive. Recently, a very friendly and highly qualified young Englishman, Prof. W. R. Hawthorne, who used to work at the M.I.T. gas turbine laboratory, has been elected to the newly founded Westinghouse Professorship for gas turbines at M.I.T.

Another laboratory where a tremendous lot of work both on jets and rockets is done, is that of the California Institute of Technology at Pasadena, Cal.; under the guidance of Professor von Karman, the results obtained there by a young and enthusiastic team are excellent, in rockets, jets, axial compressors, metallurgy, etc. It would be pointless to give a further list of laboratories. As a general rule it can be noted, however, that the importance and the scope of the research work has little or no relation to the size of the laboratory and the money spent on it. Very often extremely important work is done with very modest means; and an over-lavish supply of equipment and money tends to stifle the work, the laboratory becoming an end in itself rather than a means for obtaining research results. It may be said that the best research is done by good men who have just a little less equipment than is necessary.

If gas turbine research goes on for long at the present pace, the problem of utilizing the results without too much waste will become acute; at the present moment it is obvious that no specialist can read all the literature on the subject; and very often quite important results obtained in one place are not known by some other place, perhaps not far away, which could use them with great profit. Also, the veil of secrecy which, sometimes unnecessarily, surrounds gas turbine work renders gas turbine men very wary of accepting other peoples' results. Something will have to be done soon, on an international plane, to sift, classify and exchange data.



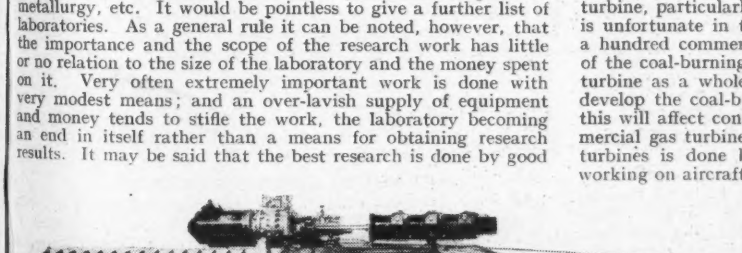
The GE-Allison J-35—37½ inches in diameter—has an 11-stage axial compressor. It is rated at 3,750 lb thrust at sea level.

INDUSTRIAL AND MARINE TURBINES

IN contrast to aircraft gas turbine work, industrial and marine gas turbines are proceeding very slowly in the United States. Except in some special cases, such as secret work for the Navy, the flow of money is spent purely on aircraft research, and the industrial turbines obtain only the scraps. The main interest for gas turbines seems to be for locomotives, the colossal commercial success of the diesel-electric locomotive having made this field very popular. General Electric and Westinghouse have both produced industrial turbines primarily made for locomotives, but clearly inspired by their aircraft turbine design. Neither can compare with what is being done in Switzerland; and, owing to the use of multiple combustion chambers put between axial compressor and turbine, a heat exchanger cannot be used without radical alterations; consequently, the efficiency obtainable is very low, unless the exhaust waste heat is used in a steam boiler.

Allis Chalmers, who used to have a Brown-Boveri licence, have designed an interesting turbine less inspired by aviation progress. Unfortunately, the tremendous demand for steam turbines obliges the large firms to concentrate on production orders and the gas turbine must take second place; there is also an unfortunate tendency on the part of the large firms to "freeze" the design of their industrial turbines and oblige the prospective customers to take what is offered, or do without; this attitude does not seem warranted by the designs offered.

With the exception of the gas turbines for the Houdry cracking process, which are not strictly real gas turbines, there are no gas turbines in the hands of commercial users in the United States; which is a real pity. A lot of money and effort are being spent in trying to develop the coal-dust-burning gas turbine, particularly for use in locomotives. This development is unfortunate in that it comes much too soon; if there were a hundred commercial turbines in use, then a possible failure of the coal-burning turbine would not affect the industrial gas turbine as a whole; as it is, if the very large sums spent to develop the coal-burning turbine do not give results quickly, this will affect considerably the future of the oil-burning commercial gas turbine. Probably the best work in industrial gas turbines is done by the relatively small firms who are not working on aircraft turbines.

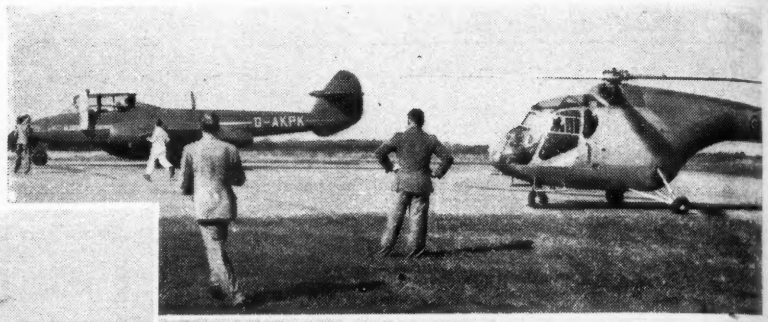


Lockheed's unusual-looking XJ-37 is designed to produce 5,000 lb thrust.

COMPOUNDED ENGINES

A VERY large amount of research and development is being done in America nowadays on the compound engine—that is, a combination of a supercharged diesel engine with some sort of gas turbine. The work is done for aeronautical as well as marine and industrial purposes. However, this subject merits and must await separate discussion.

London--Paris
46 min 29 sec



(Top, right) E. A. Swiss (Bristol 171 pilot) hands over the message to "Bill" Waterton on the Gloster Meteor at Biggin Hill. (Bottom, right) the scene at Orly, near Paris, where the Meteor landed and the message was taken over by the Westland-Sikorsky, piloted by A. Bristow. (Left) the end of the journey. Bristow landing at the Place des Invalides in Paris. In the background is the Grand Palais, the scene of many aero shows.

COMBINING the fastest type of aircraft with the slowest, a jet-propelled fighter trainer and two helicopters, produced a "record" on September 30th, when a message from the Lord Mayor of London, Sir Frederick Wells, was delivered in Paris to the representative of M. Pierre de Gaulle, President of the Municipality of Paris, in a lapsed time of 46 minutes 29 seconds, city centre to city centre.

The demonstration had for its purpose to show how full advantage of very fast aircraft on the air routes could be achieved by speeding-up the airport-to-city part of the route by the use of the helicopter. Three West-of-England firms collaborated: The Bristol Aeroplane Co., Ltd., the Gloster Aircraft Co., Ltd., and Westland Aircraft, Ltd., and the event was sponsored by *The Aeroplane*.

A Bristol 171, piloted by Mr. E. A. Swiss, was used for taking the message from the National Car Park behind St. Paul's to Biggin Hill, where the Gloster Meteor 7 two-seater was waiting. Piloted by Mr. W. A. Waterton it left immediately for Orly, near Paris, where Mr. Alan Bristow was waiting with a Westland-Sikorsky S.51. He delivered the message on the Place des Invalides to the Deputy President of the Paris Municipal Council, M. de Gaulle being away.

The demonstration was spoilt somewhat by the fact that the take-off from St. Paul's had to be postponed several times on account of poor visibility over France. The original intention was that Mr. Swiss should have taken off at 8.30 a.m., but actually he did not get away until about 12.30.

This was not, of course, the first flight between the centres of the two cities. In 1921 a number of flights were made with a Vickers Viking amphibian flying-boat piloted by Mr. Stanley Cockerell. The first of these was made on April 29th, and the experiment was continued for some time. On one occasion Mr. Cockerell brought to London as a passenger in the Viking M. Laurent Eynac, who was French Air Minister at the time. The fastest trip during the series of tests took only a little over two hours, from the Seine in the centre of Paris to the Thames at Westminster. And that was 27 years ago! A modern amphibian could reduce this time considerably.

STANDARD SCREW THREADS

NOTHING but good can accrue from the decision to standardize screw threads throughout Britain, the U.S.A. and Canada, the agreement to which is expected to be reached some time during this month. The unfortunate state of affairs whereby the Americans form their threads to one standard, whilst we in this country form ours to another, has been the cause of an immense amount of confusion and an enormous and fundamentally unnecessary amount of expense.

Although the primary advantage to be derived from a thread form of common standard is applicable in the armament field, it has, of course, far wider and, in the scale of human values, no less important advantages in the several fields of peaceful commerce. It is patent that, even when the agreement is signed, it will take some quite considerable time before its effects will begin to be felt. Nevertheless, although it is not expected that the basis of agreement will be so broad as to embrace all types of screw threads, even if a start is made only in those fields which have a direct war basis, it will be a step forward of immense strategic value and, we may hope, a precursor of greater affinity to come.

PASSING OF A PIONEER

AS we go to press we learn with regret of the death of Sir Arthur Whitten-Brown who, with Captain J. Alcock, D.S.C., made aeronautical history in June, 1919, by completing the first direct flight across the Atlantic in a modified Vickers-Vimy biplane with two Rolls-Royce Eagle engines of 375 h.p. each. Paying tribute to Sir Arthur Whitten-Brown's pioneer long-distance flight, Major Sir Hew Kilner, M.C., deputy chairman of Vickers Armstrongs, Ltd., says: "It would be hard to exaggerate the courage needed to undertake an Atlantic crossing as early as 1919. A measure of Alcock's and Brown's achievement is that it was not until eight years later than the second direct crossing by an aeroplane was accomplished."

Lieutenant Whitten-Brown was Alcock's navigator on the flight from Newfoundland to Ireland.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

"GIANTISM"

Optimum Sizes Exceeded in Many Instances

REFERRING to "Comparator" in *Flight* of August 12th and Sir Miles Thomas's "experiment in giantism," the Cunard-White Star will never again build big ships like the *Queen Mary* and *Queen Elizabeth*. From a business point of view they are 50 per cent too big. There is an optimum size to a factory unit, to an army unit, and to any commercial organization. In 1926 "giantism" caused us to build the Empire State Building, which is not a money maker and is 50 per cent too big from every point of view. S. M. UDALE.

Detroit, U.S.A.

AMBASSADOR ACCOMMODATION

Wide Choice of Layout Available

IN the issue of *Flight* dated September 23rd, there appears an excellent photograph of the cutaway Ambassador model shown on our stand at Farnborough. In the accompanying caption, however, it is described as being "a B.E.A. arrangement." In fact, the model was not designed to suit the Corporation's requirements, but was presented as an illustration of one way in which forty passengers could be accommodated in the Ambassador. At the time it was constructed no final decision had been reached as to the B.E.A. layout.

In bringing this to your attention we do not wish to appear over-critical but, in the interests of accuracy, we would like to point out that individual operators have considerable freedom of choice as regards interior layout owing to the Ambassador's spacious and unobstructed fuselage.

Christchurch, Hants. M. A. PEDDER,
Public Relations Department,
Airspeed, Ltd.

BUMBLEDOM

Complaint of a Private Owner

ON Saturday last I flew to Northolt by prior permission. On arrival I was taken to the Control buildings, where I was informed that my State landing card was not applicable, and that a fee was payable. At the same time I was requested to show the C. of A. I was then taken to the briefing room, where I was again requested to show the C. of A.

I returned to the Control an hour later to fill in the normal flight plan for clearance to Elmdon, and was again requested to show the C. of A., and also (for the first time) my pilot's licence. This necessitated a five minutes' walk across the tarmac to the aircraft, in which all documents are kept, but on return with the licence I found that no one was now interested in looking at it, and was instead confronted with a request for a Certificate of Safety for the aircraft.

Some twenty minutes of argument were wasted with another minor official in an endeavour to convince him that these have never been applicable to a private aircraft during my ownership (dating back some ten years) after which I was permitted to fill in the usual flight plan. I was not informed that this should be taken anywhere else in the building, with the result that on taxying out to the runway I was kept for a further period while the runway Controller endeavoured to discover something about my flight plan.

I formed the opinion that this is bumbledom, inefficiency and obstruction *in excelsis*, and if it is essential (which I very much doubt) to retain the services of so many officials, some of them should be taken for their higher education to a few of the well-run Continental airports which I have had the pleasure of visiting, where one is politely asked to produce on arrival any documents required, after which every assistance is given in one's intended stay or departure. They are the servants of the public and if they cannot assimilate and repeat this courtesy and efficiency, their services should be dispensed with.

This official attitude, if permitted to flourish by those responsible, cannot but be a further discouragement to private flying in this country—which may not after all be such a good idea, *vide* the Air Ministry's current efforts to re-discover the skilled aircrews to whom, after the recent hostilities, they gave no encouragement whatever to remain in flying practice through the medium of the clubs. D. K. N. EVANS.

Edgbaston, Birmingham.

SMALL-FIELD OPERATION

The Case for the Tiger Moth

IT would be interesting to know the views of private owners as to the best machine for operating in confined spaces. I believe the Tiger Moth is unequalled. A short time ago I put one down on a piece of land with an area of half an acre ; the longest distance across the plot was 57 yards. At the end of the run there was a petrol bowser and an 11-ton tractor; landing was partly cross wind. The approach was unobstructed, but an overshoot meant a certain "write off," owing to a furrow with a vertical side of 15in bordering the area; a not too steady breeze was blowing at about 20 m.p.h. The take-off run available was 55 yards but not more than three-quarters of this was used.

The important point is that this landing and take-off was undertaken with confidence. "TIGER TOM."

Apethorpe, Peterborough.

AIRPORT CONGESTION

M.C.A. Should Study the Air Lift

FAR be it from me to pose as a statistician—I have, in fact, a certain distrust of the species—but the following thoughts may perhaps, have some merit without the backing of figures.

Sir Frank Whittle (*Flight*, September 23rd), among others, has drawn attention to the increasing problem of the airfield handling of ever larger and faster aircraft carrying greater and more varied cargoes; and the speculation concerning the future "capacity" of our larger airports has, I feel, a somewhat dubious and too hypothetical basis. But surely we have before us a magnificent example of practical airfield controlling in the Berlin Air Lift. I know no more details of this than are contained in the daily Press [detailed accounts have appeared in *Flight* since this letter was written.—ED.], but there must be something to be learned from this huge daily flow of several hundred machines from a severely limited number of airfields. The machines are of widely differing types, the fields are by no means the most spacious in the world, and both passengers and a variety of goods are handled. My suggestion then is that a representative of those in M.C.A. (or elsewhere) who are concerned about our future traffic control should go over and inspect this spectacle, and derive the benefit therefrom.

Even further be it from me to suggest that a large body of Government officials should make a nuisance of itself by using up valuable seats and rations and interfering with the Air Forces who are getting on with the job. But let the M.C.A. be exemplary in sending *one* responsible representative to Berlin for a few weeks to applaud, to learn, and finally to inform. J. GRANT DUNCAN.

Wick, Caithness.

FORTHCOMING EVENTS

Oct. 8th.—Lancashire Aero Club : Annual Ball, Grand Hotel, Manchester.
Oct. 9th.—The British Interplanetary Society : "Interplanetary Man," Olaf Stapledon.
Oct. 13th.—R.Ae.S. (Hatfield) : "Aircraft Photography," John Yoxall.
Oct. 15th.—Second International Air Ball at London Airport.
Oct. 16th.—Wolverhampton Aero Club : The Siddeley Trophy Race.
Oct. 21st.—Royal Aeronautical Society : "Cold Weather Operation of Aircraft," G. W. Wilson, A.F.R.Ae.S. and S/L E.P. Bridgland, R.C.A.F., B.Sc., A.F.R.Ae.S.
Oct. 22nd.—Bristol and Wessex Aeroplane Club : Aviation Ball, Grand Spa Hotel, Bristol.
Oct. 26th.—R.Ae.S. (Graduates and Students) : "Flight Refuelling," Sir Alan J. Cobham, K.B.E., Hon. F.R.Ae.S.
Oct. 27th.—R.Ae.S. (Preston) : "Design Problems of Large Flying Boats," H. Knowler, F.R.Ae.S.
Oct. 30th.—S.L.A.E. (South Eastern Area) : "High Speed Flight," by W. A. Waterton, Manson House, 26, Portland Place, London, W.1. at 3 p.m.
Nov. 1st.—R.Ae.S. (Derby) : "Fighter Aircraft of the World," Sqn. Ldr. H. F. King, M.B.E.
Nov. 10th.—R.Ae.S. (Graduates and Students) : "Flying Experiences," Lt. Cdr. (A) E. M. Brown, O.B.E., D.S.C., A.F.C., M.A., A.R.Ae.S., R.N.
Nov. 12th.—Redditch Society : "Aircraft Photography," John Yoxall.
Nov. 17th.—R.Ae.S. (Hatfield) : "Design Problems of Large Flying Boats," H. Knowler, F.R.Ae.S.
Nov. 17th.—R.Ae.S. (Preston) : "Investigation of Aircraft Accidents," A. Cdre. Vernon Brown, C.B., O.B.E., F.R.Ae.S.

SERVICE AVIATION

Royal Air Force and Naval Aviation News and Announcements

THE FLEET EXERCISES: Among units of the Home Fleet participating in the biggest post-war Naval manoeuvres were the carriers Theseus *(in the rear) and* Illustrious. *The battleship* Duke of York *is shown leading them in this aerial view. Fireflies and Sea Furies with wings folded may be discerned on the flight deck of* Theseus.

LORD TEDDER ON THE R.A.F.

Present and Future Problems : The "Straight Left" and the "Right Guard"

THERE follows, *in extenso*, an address by Marshal of the R.A.F. Lord Tedder, delivered on September 27th before the Headmasters' Conference at Oxford. In the view of *Flight* this is the most lucid and inspiring pronouncement of its kind yet uttered.

"In these days one sees and hears much as to the possibility of yet another war. You will not, I am sure, expect any prophetic utterance from me on this issue. No, we (and by 'we' I do not mean only we military, I mean the British people) are faced by a much more immediate and practical problem. You will remember how at San Francisco some three years ago that far-seeing statesman, General Smuts, christened the newborn United Nations Organization with the phrase 'this is peace with teeth.' At that time there were many who did not see or understand the deep wisdom and truth of that saying; there were others who refused to see. Times have indeed changed, and I imagine there are few people in this country now who do not realize that we must look to our 'teeth' if we are to maintain a peace worth having. In these days of power politics, naked and unashamed, the fate of the impotent is tragic indeed, as we have seen within the past few months. That is the problem that faces us. It is an immediate problem because of current international affairs; it is also a long-term problem, since it is clear that power politics are with us for some time.

"Not an easy problem. 'Power' is not merely so many armed forces and so much military equipment. Real power is a composite of moral and material factors, of economic and military strength. Excessive military expenditure might well lead to economic weakness, which itself would result in losing the peace. That is one delicate balance that has to be reached. Then in the military expenditure itself another difficult balance has to be reached—between the expenditure on preparations for defence against war on land, at sea, or in the air respectively. A few moments ago I expressed my dislike of indulging in prophecy but some gazing into the future is essential—our defences must be organized for the present and for the future, not for the last war but one. Though we must have one foot firmly placed in the present, the other must be reaching forward to the future.

"Priorities"

"You will remember that in a statement on defence a year ago in the House the Minister of Defence gave an order of priority: first, research and development; secondly, air defence, including a strong air striking force; thirdly, defence of sea communications. You may have noticed in the White Paper on defence which was issued later, the word 'priority had disappeared. The use of the word priority was open to misconstruction, it is often taken to be exclusive, which in this context would be absurd. There must be a balance between the allocations of manpower and material of the land, sea and air forces respectively, priority being given to certain aspects of defence in the form of emphasis. That balance depends on correct assessment of the lessons of World War II, coupled with appropriate adjustments to meet the clearly foreseeable future. Now, more than ever before, the armed forces of the country must be approximately of a size and composition which has public support and is in general accord with public ideas as to what is necessary. If the public were to accept the advice of some military writers who still write of World War II in terms of 1917-1918 I should be worried; I suspect, however, that the British public, with that uncanny and unerring instinct of its own, has formed its own shrewd judgment, and that that judgment will not be far wrong.

"I think there are few people nowadays who would challenge the view that the R.A.F., supported by the A.A. guns, is now very literally your first line of defence. Attack from the air is not only the most dangerous threat to which we would be exposed in the event of war, it could be most sudden and could develop to a dangerous scale most quickly. Air defence must therefore come first. There is, however, one aspect of the structure of air defence which I have sometimes in the past found to be misunderstood, even in high official circles. I have met the view that air defence in the air is carried out solely by fighters; I have even heard the opinion expressed that fighters are the only aircraft needed for air defence. Both these views are, of course, demonstrably false. It was Bomber Command that delayed the V weapons attack for many months, greatly reduced the scale of the attack both before and after it

Service Aviation . . . . .

had opened, and finally practically dried up the attack by paralysing German rail communications. It was Allied bombers who were largely responsible for the air superiority over the beaches, which made the invasion of Sicily, Italy and Normandy possible.

"The Germans, fortunately, fell into the error of thinking that fighter defence was the answer to the Allied bomber offensive. In September, 1944, they were producing considerably more fighters than the total Anglo-American fighter production (which, of course, had to feed all war theatres), yet by that time Allied air superiority was almost absolute. No. The most effective defence against air attack is to stop it at its source. In future it may be the only way, especially against the rockets. The bomber and the fighter are complementary to each other—the straight left and the right guard. And without the air superiority which it is the role of that joint force to secure, no effective military operations are possible on land or at sea—nor indeed can the normal industrial and economic life of the country be maintained.

"I am sometimes asked whether the piloted aircraft is not already out of date. My answer to that is 'No.' There will, of course, be technical developments in rocketry, but to get drastic improvements in range, size and accuracy will take time and much research. Pilotless fighters and pilotless bombers are by no means impossible, but I see us always needing aircrew for many duties and years before they lose their fighter and bomber jobs. I see the basic structure of the Service remaining much the same as it is now for some considerable time—that is to say, based on its main functions—fighter, bomber, transport, reconnaissance, anti-submarine and tactical support. The Home Commands are organized on this functional basis (except that the Tactical Command is in Germany). Middle East and Far East Commands are composite.

"You may like me to give you a brief line on the post-war Air Force. I think the first thing to get hold of is that ever since V.J. Day the Service has been through a pretty strenuous purgatory. As you know the Release Scheme was designed on the basis of simplicity and justice to the individual. It achieved those ends admirably, but its effects on the Service were serious. Apart from the rapid loss of trained men the scheme brought about a serious unbalance in the R.A.F. In some trades we had a sufficiency, in other key trades we were desperately short. This led not only to serious disorganization through a highly complex and technical Service, but also to a no less serious loss of morale.

"In two years nine out of every ten men and women in the ranks on V.J. Day had gone and more than half of the remainder had less than two years' service. During this time our position regarding the grant of permanent commissions was stagnant. Until we knew just what forces we should need after the war we were unable to give any firm answer to the wartime officers who wished to stay on. As a result we lost to civilian life very many of the best of our war-experienced officers. Add to these problems large numbers of aircrew just completed their training, or partly trained, whose flying had to cease arbitrarily as the schools closed down. Add further the periodic intake of conscripts filtering into units disorganized by the run-down and demoralized by the presence of many waiting only for the very day of release—men who 'couldn't care less.'

From the Slough

"I do not believe that any business or industrial organization faced with such conditions would for a moment dream of attempting to carry on.

"The Royal Air Force did carry on—heaven only knows how—and now, believe it or not, it is beginning to emerge from the slough. We have still got many problems to solve; it will be a long time before we have really cleared up the aftermath of the run-down—but we are on the way. I began to sense it first last year overseas, but this year there have been many signs of recovery despite our continuing difficulties of unbalanced trades, shortage of regular enlistments, etc. The Cadet College at Cranwell is holding up its head again. Their showing when the King presented the Colour last summer was, in every way, something for pride. I expect some of you have visited it this year. If you have not yet done so I hope you will. One does, of course, expect the Cadet College to be of top standard.

COASTAL V.I.P.s: Coastal Command personalities photographed at St. Eval during the recent Fleet Exercises (L. to R.) A.V.-M. D. V. Carnegie, C.B.E., A.F.C., A.O.C. No. 18 Group; Air Marshal Sir Leonard Slatter, K.B.E., C.B., D.S.C., D.F.C., A.O.C. in C. Coastal Command, and A.V.-M. F. L. Hopps, C.B., C.B.E., A.F.C., the A.O.C. No. 19 Group.

"The recent air exercises gave, however, an indication of the state of mind throughout the Home Commands. The exercises went on by day and night for two and a half days irrespective of the weather. During this time I had the opportunity of visiting, apart from various operation rooms and three U.S. bomber groups, some 27 R.A.F. Squadrons, including four Auxiliary Squadrons, and I must say that the standard really was most encouraging, day and night, good weather and bad. The other recent test, which came straight out of the blue, was the Berlin air lift. A test of the efficiency in fair weather and foul of the pilots and navigators, of the maintenance ground crews, of the signals and control personnel. When a big job comes along one expects a lot from the troops, and one hopes for still more—but in this case they have far exceeded even one's hopes.

"I will leave the details as to methods of entry into the Service, conditions, etc., to be dealt with by my colleagues, but I would like to say a few words on what the Service needs.

"Sometimes I have been asked by a prospective entrant, 'What shall I get out of the R.A.F. if I join it?' My answer to such questions is, 'I'm not interested in that. What I *am* interested in is what—if anything—the R.A.F. would get out of you.' I think that a prospective entrant should quite properly check up to see what the conditions of service, pay, career, etc., are, but I am sure that the great history of our service has been made by men who came in because they wanted to *serve*, not because the regulations showed that after X years' service they would get Y pounds pension. I have seen it reported that the modern generation lack the idea of service. My limited experience would not confirm that as a generalization. I hope your experience affords hope that the spirit of service may revive even if it has lagged a little in the post-war reaction. To some people it may appear sentimental to say that the Service wants young men who have a *call* to serve their country in the air—I believe it to be a cold statement of fact.

"On the subject of what the Service needs I have heard it said that the R.A.F. really has no justification for commissioning so many of its junior men; the suggestion is that the young Air Force officer has no effective command, he has no need of leadership. In my opinion this is an utter misconception of what is required from the young officer It is true that the average young Air Force officer does not have a platoon of men under him on whom he can exercise his command and develop his leadership by marching them about the parade ground or leading them in open order across the common. No; his problem is much more subtle, much more difficult.

"On the ground he has to exercise his leadership before men who possess technical skill he is never likely to acquire, men who will, by the nature of their work, rarely be gathered together as a single body of men. In the air also the officer will rarely, if ever, get the support of the herd which accompanies the more simple forms of military leadership. The young Air

Service Aviation . . . . .

Force officer needs leadership, leadership of a high order, the leadership which is based on personal and individual integrity and example, the leadership which inspires loyalty by imagination and understanding.

"I have also heard it said that the Air Force officer has nothing to do but fly—a horrid hang-over from the days of active and intense operations during the late war. During times of great operational intensity it is, of course, true that aircrews had to be given maximum opportunity to recuperate between sorties, and they were consequently relieved of many of their normal duties by temporary ground staff officers. This was clearly a war emergency measure and, even so, was by no means always applied in units overseas.

"It is remarkable how many misconceptions there are about the nature of the Air Force job. I have had young fellows ask me, 'What shall I be given to do when I stop flying in five or six years?' I agree that there are some types of operational flying which call for a standard of physical fitness probably the perquisite of youth—say under 30—but flying and flying appointments are *not* a monopoly of youth. Twice during the air exercise the Commander-in-Chief of Fighter Command fetched up at the airfield I was visiting flying his own single-seater fighter (nothing unusual about this), just a normal practice.

"Sometimes one hears it said that what the Air Force lacks is the tradition of the older Services. Length of tradition we do lack—that is inevitable, but I will give way to no one on the *quality* of our tradition. Events such as the Battle of Britain, the defence of Malta, the retreat to El Alamein have inevitably caught the eye of the public and the historian, but they are but expressions of what I regard as the most fundamental and deep-rooted tradition in the Royal Air Force—the tradition that nothing is impossible—that, *somehow*, any new problem can be solved, and if the old and traditional methods won't do new methods must be devised. Supply of Berlin was impossible—but—!

"This is one of the reasons why I say the Royal Air Force needs young men with a call, men with vision and faith, vision to see how the ever-changing problems of the future (scientific, technical, strategic, tactical) can be met and solved, and faith in Air Force power as the guardian of peace and, in war, the architect of victory."

Award

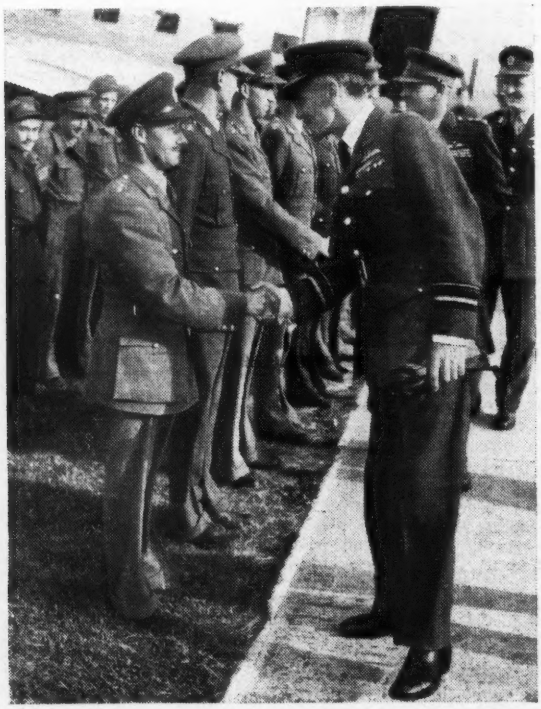
The King has been graciously pleased to approve the following award:—

George Cross

Flight Sergeant Stanley James Woodbridge (deceased), R.A.F.V.R., No. 159 Squadron.

FLT. SGT. WOODBRIDGE was a wireless operator in the crew of a Liberator which crashed in the jungle in Burma whilst operating against the Japanese on Jan. 31st, 1945. Together with five other members of the crew he was captured by the Japanese, who tortured them in an endeavour to obtain information of use to the Japanese Intelligence Service. Eventually the four N.C.O.s were separated and conveyed by motor transport to a forest, where they were put to death by beheading. Three officers and three N.C.O.s of the Imperial Japanese Army were subsequently brought to trial by a Military Court, charged with the torture and murder of the four airmen; they were all found guilty. Three were hanged and three sentenced to terms of rigorous imprisonment. At the trial it was revealed that the Japanese concentrated their efforts on Flt. Sgt. Woodbridge in an endeavour to obtain technical information regarding wireless equipment, secret codes, wavelengths, etc. A Japanese technical officer was detailed to make the interrogation and the services of two interpreters were engaged; but, in spite of repeated torture, including kicking, beating with belts and with a sword, Flt. Sgt. Woodbridge steadfastly refused to reveal any information whatever. The final interrogation took place actually at the place of execution, when it was obvious to the unfortunate prisoner that he was to be put to death; even so, he maintained his courageous attitude to the end, merely remarking that if the Japanese were going to kill him they should do it quickly. After all efforts to make him speak, including further torture, were found to be fruitless, this gallant N.C.O. was beheaded on February 7th, 1945. Flt. Sgt. Woodbridge behaved throughout with supreme courage. His fortitude, loyalty to his country and his complete disregard for his own safety, even unto death, constitute one of the highest examples of valour in the annals of the Royal Air Force.

Flight Sergeant S. J. Woodbridge, G.C.



AID FROM THE UNION: The Senior Air Staff Officer of Transport Command, A.V.-M. R. L. Ragg, C.B.E., A.F.C., welcomes one of the 50 aircrew members of the South African Air Force who are to fly R.A.F. aircraft in the Berlin air-lift.

R.A.F. Supplementary List

THE Air Ministry announces the opening of the R.A.F. Supplementary List to former airmen and airwomen who are willing and ready to return to the Service at the very outset of an emergency. This will be their only obligation. They should write or apply to any R.A.F. Station or Recruiting Centre, to Air Ministry (S.14(a)), London, or at the Air Ministry Information Bureau, Kingsway, London. There is already a supplementary list for former R.A.F. and W.A.A.F. Officers.

Appointment

THE Air Ministry announces the appointment of Air Vice-Marshal C. W. Weedon as Senior Air Staff Officer to R.A.F. Technical Training Command, taking effect from Oct. 18th. A.V-M. Weedon has been A.O.C. No. 41 Group, Maintenance Command, since July, 1946.

Auxiliary Appointments

SQUADRON LEADER D. E. PROUDLOVE has been appointed Commanding Officer of No. 600 (City of London) Squadron, R. Aux.A.F.; vice S/L. T. N. Hayes, D.F.C. The present base of No. 600 Squadron is at Biggin Hill, with Town H.Q. at Finsbury Barracks, City Road, E.C.1. Volunteers with R.A.F. experience prepared to meet the Squadron's urgent need for ground crews should apply in writing to S/L. Proudlove at R.A.F., Biggin Hill.

S/L. A. H. P. Noel is to command No. 3615 (County of Glamorgan) Air Defence Unit, R.Aux.A.F., based at R.A.F. Station, Cardiff. The Unit is affiliated to No. 614 (County of Glamorgan) Auxiliary Squadron.

Reunion

NO. 143 Squadron Reunion will be held on Saturday, December 11th, 1948, at the Unicorn and Dukes Restaurant, 177, Jermyn Street, S.W.1. Details from J. A. Selka, 68A, Emm Lane, Meaton, Bradford, Yorks.